THE IRON TRADE REVIEW

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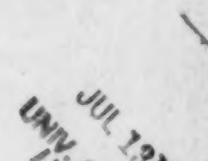

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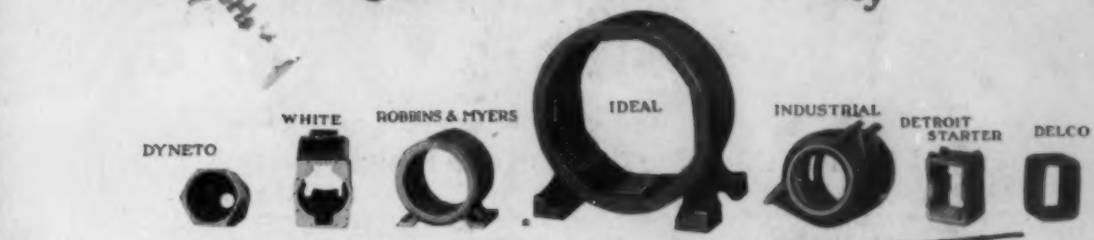

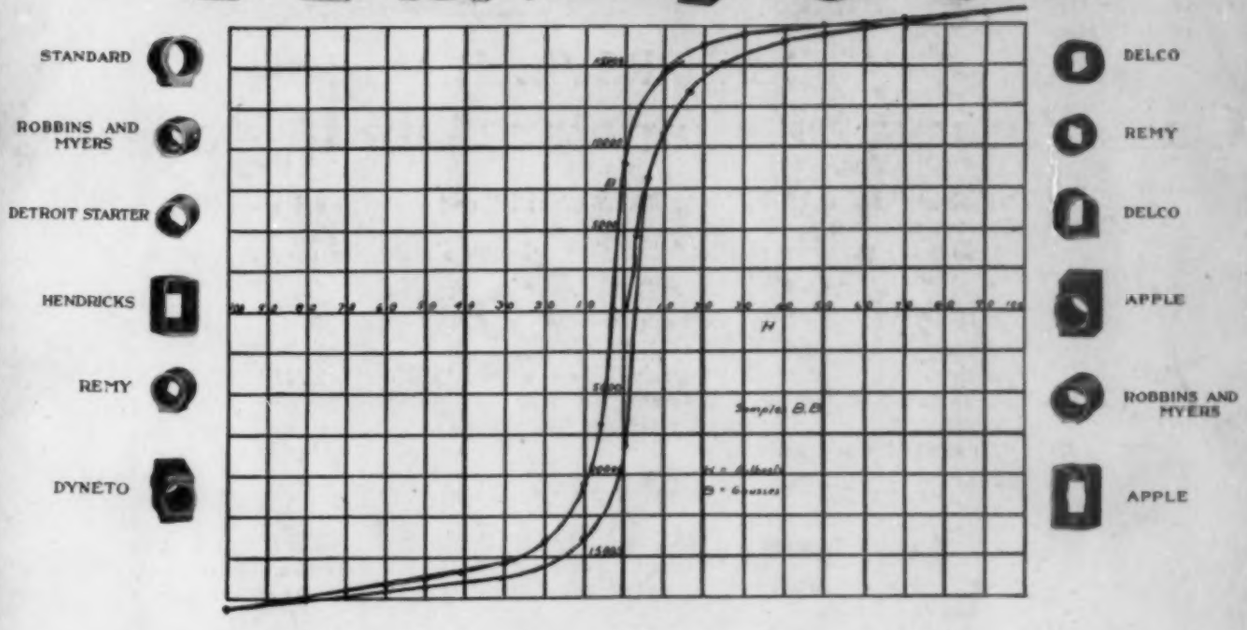

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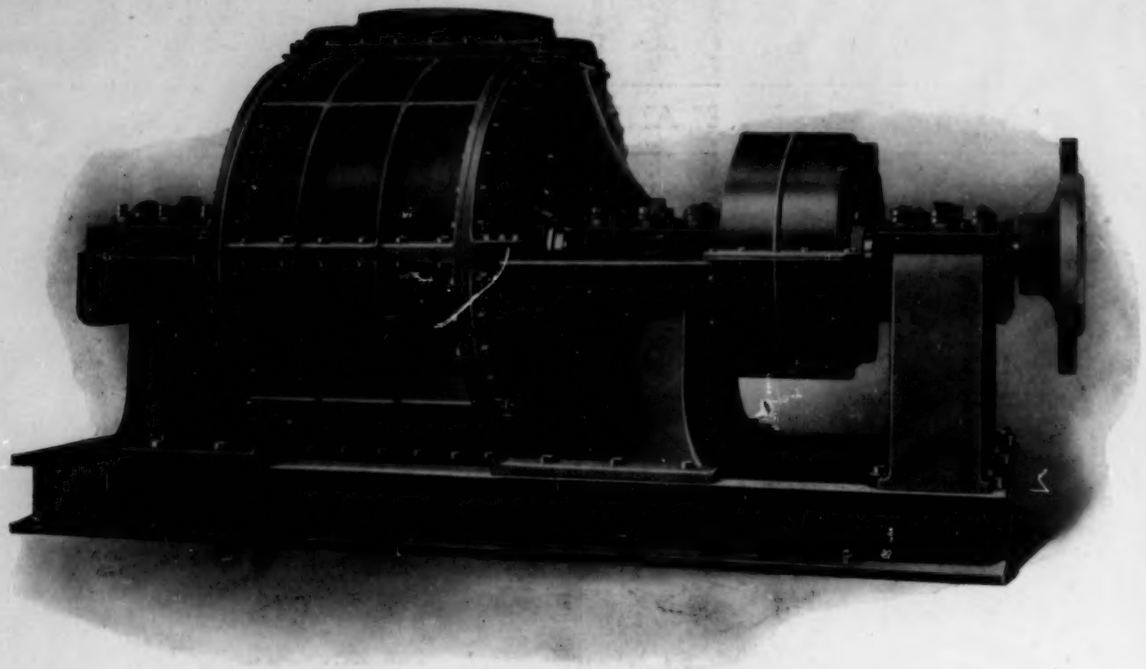

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THE IRON TRADE REVIEW

Vol. LIX Cleveland, July 13, 1916 *No. 2*

Foreign Demand Now Dominates

Russia Placing Tremendous Orders in This Country and Many Inquiries Are Pending From England, Italy, France, Japan and China

FOREIGN demand dominates the iron trade. While it is clear that some of the belligerents, particularly England, are much better equipped than they were a few months ago to manufacture munitions, Russia is still looking confidently to America to provide it with finished war materials and there is increasing demand from other countries for semi-finished material, such as forgings and shell steel. Naturally, owing to the high prices of all finished materials, buying for purely domestic purposes is not very active and this fact is reflected in the decrease of unfilled orders of the Steel Corporation.

The Steel Corporation's ore needs for the current season are estimated at 30,000,000 tons.

Pig Iron

The buying of pig iron for domestic uses is extremely light, but in spite of labor shortage in some sections, which has curtailed production of castings, shipments on contracts are going forward freely and are nearly equal to production in most parts of the country. Inquiry from foreign lands continues heavy. The Struthers Furnace Co. will blow in its rebuilt stack at Struthers, O., in a few days and will operate on bessemer until it makes the 20,000 tons of that grade recently sold for export. Sales of the week include tonnages of fair size for shipment to Italy and France.

Plates

Some additional orders for plates for export have been placed and inquiries for very large tonnages are pending from Japan, England, China, Italy and other foreign countries. Labor troubles in the Philadelphia district are interfering somewhat with the operations of ship builders.

Railroad Buying

The Russian rail order as finally placed calls for about 450,000 tons, which represents an expenditure in this country of about $23,000,000. Rails are to be delivered by July, 1917, and it will be impossible for American rail mills to accept any new rail orders of size for shipment before the middle of next year. Russian railways are more active in closing the large car order, pending for several months, which, it is believed, will amount to fully 30,000 cars and may be more than 40,000. Russia is also in the market for from 600 to 1,000 locomotives. The purchase of the Nickel Plate railroad by Cleveland interests in order to obtain better terminal facilities for suburban lines will, it is believed, result ultimately in large expenditures for electrifying old lines and building new lines from Painesville on the east to Elyria on the west. It is not expected that the plans will assume definite shape at an early date.

Steel Bars

The implement trade is buying steel bars for the first half of next year actively and 80,000 tons already have been booked, of a total of about 300,000 to be closed. The mills first named 2.50c, but have accepted 2.35c, Pittsburgh. July new business in general with large producers is on a heavier scale than in June. Bookings continue to be dominated wholly by the ability of the maker to accommodate them as regulated by ingot capacity. There is a heavy demand for cotton ties. The Skinner & Eddy corporation, Portland, Ore., booked three vessels for delivery in the third quarter of next year and the steel, about 11,000 tons, has been placed with the Corporation. Carnegie Steel Co. has ordered 450 cars from various builders.

Electric Steel

The rapid increase in the production of electric steel is shown in the statistics for the past year and by the issuing of permits by the Steel Corporation for the use of the heroult electric furnace. During the first half of 1916, 28 heroult furnaces were authorized in this country and Canada, or four more than the entire number for the year 1915. Other types of electric furnaces are also being built and the production of alloy steel seems at present to be in excess of demand.

THE OPEN HEARTH

Keep a File

A FEW months ago, a prominent firm, which had kept and bound the numbers of *The Iron Trade Review* for several years, decided that it ought to have a complete file for as many preceding years as possible. In order to obtain missing numbers for past years, it was necessary to go to a great deal of trouble and some expense, and in spite of most persistent efforts, it was impossible to complete the file for several years. Doubtless other readers of *The Iron Trade Review* are constantly feeling the need of bound volumes for reference. The fact that many write to this office for information that could be readily obtained by reference to the bound volumes is evidence that many who need the volumes of past years have not preserved them.

The fifty-eighth volume of *The Iron Trade Review*, being for the first six months of this year, was completed with the last number in June and the index for that volume has just been compiled. Now is the best time for anyone who has kept a file of the papers for the last six months to have it bound, and for others to begin now to keep the weekly issues for binding at the end of the year. The past six months have been of extraordinary interest in the iron trade and many, many times in future years will the record be referred to. Hence we strongly advise the keeping of a file.

The Tungsten Market

THE market for tungsten and tungsten ore during the past year has been marked by most extraordinary features. Owing to the extreme scarcity of tungsten last year, prices rose to fabulous figures—in fact, out of all reason. This condition, which was thoroughly unsound, was the result of a sudden demand, due to the European war rather than to scarcity in the United States. Inflated prices encouraged the production of tungsten ores to such an extent that vast numbers of prospectors and miners hoping to attain great riches went to various parts of the country, notably to Boulder county, Colorado, where tungsten mines worked in past years and abandoned on account of the production being too limited to justify operation were re-opened and other fields explored. This great rush, followed by largely increased production, resulted in such large supplies of tungsten ores and concentrates being made available early in the spring of 1916 that the market price began to decline until as low as $35 per unit for 60 per cent concentrates has been quoted, although $40 is at present the usual quotation.

It is evident that the users of tungsten-bearing steels became somewhat over-anxious during last winter and bought more than they needed for their immediate requirements, and, owing to the demand for steel, the steel manufacturers over-bought tungsten supplies. Even at present prices, large quantities of tungsten ores will be taken out of the ground, but, on the other hand, the richest territory has been thoroughly worked and a considerable buying movement on the part of steel manufacturers would soon advance the price of the ore. While many companies still have a fair supply on hand, some will be compelled to come into the market in the near future and their appearance will no doubt tend to send prices upward again. On the whole, it seems probable that 60 per cent tungsten concentrates will be little, if any, lower in price this year than at present and that the late fall and winter may bring a considerable advance. It is not probable, however, that the extremely high prices of last winter will again be reached.

The Revenue Bill

THE revenue bill which passed the national house of representatives Monday of this week is a remarkable document and shows how a great political party is compelled to recognize conditions and conform to popular mandate, regardless of the past history of the party. In other words, several features of the bill are thoroughly inconsistent with the record of the party now in power, particularly as to the granting of protection on dyestuffs and the provision for a tariff commission. Whether the proposed duty of from 15 to 30 per cent is adequate, we do not know. No one can tell how much protection will be needed until after the country has had some *post bellum* experience, or at least until a scientific investigation has been made. The provision in regard to a gradual reduction of the tariff is similar to that provided in the McKinley law which established the tin plate industry of the country.

The tariff commission sections are highly commendable and certainly will result in a vast amount of valuable information being compiled.

One of the weakest features of the bill is the effort to prevent dumping, which is described in the measure as unfair competition and is defined to be "to import or assist in importing any articles from any foreign country into the United States, to commonly and systematically sell or cause to be sold such articles within the United States at a price substantially less than the actual market value or wholesale price of such articles, at the time of exportation to the United States, in the principal markets of the country of their production, or other foreign countries to which they are commonly exported, after adding to such market value or wholesale price, freight, duty, and

THE OPEN HEARTH

other charges and expenses necessarily incident to the importation and selling thereof in the United States". The bill provides, however, that such act or acts must be done with the intent of destroying or injuring an industry in the United States, or of preventing the establishment of an industry in the United States, or of restraining or monopolizing part of the trade and commerce in such articles in the United States.

The bill makes the violation of this anti-dumping clause punishable by a fine of not exceeding $5,000 or imprisonment not exceeding one year, or both. But a mere reading of the definition of unfair competition is enough to suggest how difficult the enforcement of the law would be. Some of the questions which naturally come to one's mind are: When is one commonly and systematically selling such articles? Who is to determine what is a price substantially less than the actual market value or wholesale price? How can it be proved that the importer intends to destroy or injure an industry, or prevent the establishment of an industry? Doubtless there would be endless controversy at the custom houses and in the courts. How much easier and simpler it would be to authorize the President of the United States or the federal trade commission to assess a tariff high enough to shut out all unfair competition whenever such action might be necessary.

War's Effect on Production

THE statistics of production of steel ingots and castings and finished forms of rolled iron and steel in the United States last year, just published by the American Iron and Steel Institute, are interesting, not only because production was record-breaking as to most materials, due largely to the demand for munitions and machinery for export, but also because of some noteworthy exceptions and of some unusual results.

The production of steel ingots for 1915 was 31,284,212 tons, or almost exactly a million tons more than the production for 1912 and 1913, which were remarkable in producing almost the same tonnage, the figures being 30,284,682 for 1912, and 30,280,130 for 1913. Again the remarkable development of the open-hearth process is manifested, for while the open-hearth production for 1915 was 22,943,770 tons, compared with 20,689,715 tons in 1913, the bessemer production declined from 9,465,200 tons in 1913 to 8,104,737 tons last year.

A marked increase in the production of acid open-hearth steel castings as compared with basic open-hearth is disclosed. In 1909, '10, '12, '13 and '14 the production of castings by the open-hearth process exceeded that by the acid process, but in 1915, 402,229 tons were produced by the acid process, and only 333,103 tons by the basic. In 1914, the production by the acid process was 270,173 tons, and by the basic process 334,144 tons. One explanation is that as castings can be made more cheaply by the basic process, it is resorted to in a year of depression like that of 1914, but the specifying of acid castings for war material and also for hydraulic presses, of which many were made last year, is principally accountable for the increase in production by the acid process. The production by bessemer converter process reached a total of 92,476 tons last year, a new record, showing the increased use of the side-blow converter. The largest percentage of increase, however, is shown by electric steel castings, with a total of 23,064 tons, compared with 9,207 tons in 1913 and 8,551 tons in 1914.

Comparing 1913 and 1915, we find that the 1915 production is the following percentage of the 1913: Iron and steel rails, 63; plates and sheets, 105.5; nail plate, 85.1; wire rods, 125.3; structural shapes, 80.2; all other rolled products, 105.1; total of all kinds of finished rolled iron and steel products, 98.5. The decrease in the production of rails reflects the inactivity of railways in placing orders and is due also in part to the use of rail mills in making large rounds for munitions. But probably to a greater extent than rail mills, structural mills were used in making rounds and this fact is indicated by the decline in the production of structural shapes. The large increase in the production of wire rods is due principally to the demand for wire products for export.

If We Could Speed Up

(*From a recent address by George E. Roberts, assistant to president of National City Bank, New York.*)

THERE is no line of production in which improvements are not always possible; they are being made all of the time. The steel industry is undoubtedly one of the most efficient industries in the country, and yet the by-product coke oven is just coming into use. A professor of chemistry in one of our large universities said the other day that if you would throw a tennis ball into Lake Michigan, the amount of water with which the ball came in contact as compared with all the water in the lake, would illustrate our knowledge of chemistry. Scarcely a process in industry is the same now as it was 20 years ago, and scarcely a process will be the same 20 years from now that it is now. What if we could speed up the changes and make them in 10 years instead of 20?

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products July 12, average for June, 1916, average for April, 1916, and average for July, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices July 12, 1916.	Aver. for June, 1916.	Average for Apr., 1916.	Aver. for July, 1915.
Bessemer pig iron, Pittsburgh	$21.95	$21.95	$21.95	$14.88
Basic pig iron, Pittsburgh	18.95	18.95	19.20	13.83
No. 2 Fdy. pig iron, Pittsburgh	19.45	19.45	19.45	13.60
Northern No. 2 Fdy., Chgo.	19.00	19.00	19.00	13.00
Lake Superior Charcoal, Chgo.	19.75	19.75	19.75	15.75
Mall. Bess., Chgo.	19.50	19.50	19.50	13.00
Southern No. 2, Birmingham	14.00	14.15	15.00	9.62
Southern Ohio No. 2, Ironton	18.50	18.46	18.50	12.60
Basic, eastern Pa.	19.00	19.25	20.50	13.75
No. 2X Virginia furnace	18.50	18.00	18.50	12.50
No. 2X foundry, Philadelphia	20.00	20.00	20.75	14.50
Ferro mang., Balti., (1917)	175.00	175.00	175.00	103.00
Bessemer billets, Pbgh.	40.00	41.20	45.00	21.40
Bess. sheet bars, Pbgh.	40.00	41.20	45.00	21.70
Op.-h'th sh. bars, Pbgh.	40.00	41.20	45.00	22.00
Open-hearth billets, Pbgh.	40.00	41.20	45.00	21.50
Steel bars, Chgo.	3.10	2.69	2.64	1.46
Steel bars, Pittsburgh, contr.	2.50	2.50	2.50	1.26
Iron bars, Philadelphia	2.559	2.559	2.559	1.25
Iron bars, Cleveland, local del'y.	2.40	2.40	2.40	1.20
Iron bars, Chgo. mill	$2.35	$2.35	$2.35	$1.20
Beams, Chgo.	3.10	2.69	2.64	1.46
Beams, Pittsburgh, contr.	2.50	2.50	2.50	1.26
Beams, Philadelphia	2.659	2.659	2.659	1.35
Tank plates, Pbgh., contract	2.90	2.75	2.67	1.22
Tank plates, Chicago	3.50	3.09	2.94	1.39
Tank plates, Philadelphia	3.909	3.909	3.909	1.35
Sheets, blk., No. 28, Pbgh.	3.00	2.92	2.91	1.77
Sheets, blue an., No. 10, Pbgh.	3.25	3.10	3.00	1.35
Sheets, galv., No. 28, Pbgh.	4.35	4.79	4.89	4.55
Wire nails, Pittsburgh	2.50	2.50	2.40	1.59
Connellsville fur. coke, contr.	2.40	2.63	2.98	1.75
Connellsville fdy. coke, contr.	3.15	3.50	3.50	2.25
Heavy melting steel, Pbgh.	16.50	16.25	18.12	13.38
Heavy melting steel, east'n Pa.	15.25	15.75	17.75	12.00
Heavy melting steel, Chgo.	14.00	15.35	16.75	10.15
No. 1 wrought eastern Pa.	19.75	20.75	23.00	13.50
No. 1 wrought, Chgo.	15.25	15.35	16.80	8.90
Rerolling rails, Chgo.	16.00	16.25	17.90	10.10
Car wheels, Chgo.	12.50	12.50	14.00	10.30

(For Additional Prices See Page 100.)

Foreign Inquiry for Pig Iron

Is Still the Leading Feature of an Otherwise Dull Market—

Some Signs of Buying Movement at Chicago

New York, July 11.—Makers and sellers of pig iron continue to be almost entirely occupied with foreign business and the vigorous activity of the export market is in sharp contrast to the utter absence of buying inclination among domestic consumers. Additional sales for foreign delivery during the week in this territory have been not less than 10,000 tons largely to Italy. One house alone disposed of about 5,000 tons in various lots. Among the transactions were 2,000 tons of valley bessemer placed through a trading company at $21, furnace, 2,000 tons of Alabama No. 2 soft which brought better than $14, Birmingham, some tonnage of low phosphorus, 500 tons of malleable and other grades. Buffalo malleable for export was done at $19.25, furnace. The French government which recently through a leading New York house has bought 25,000 tons or more of special and standard bessemer, is likely to be a further purchaser of 10,000 to 20,000 tons of steel-making grades. Among the new inquiries put forth this week are 5,000 tons of bessemer by one middleman, 2,500 tons in two lots of special bessemer and high phosphorus by another and various other tonnage. In addition there are many inquiries recently current on which there has been no action. It now is quite difficult to obtain a $30 ocean rate to lower France and to the Mediterranean. Some lines have been asking $1.50 per 100 pounds or $33.60 per gross ton. The domestic market is wholly without interest or feature. One buyer in this territory has opened negotiations on 1,500 tons of foundry grades. Prices continue soft and are not well defined in view of the inactive market.

Some Activity in Chicago

Chicago, July 11.—Indications are being felt that at least a small buying movement is starting in the pig iron market in this district. After a period when practically no inquiry was being made, a slight inquiry is evident, mostly for small tonnages, the largest now current being for 500 tons. This business seems to be brought about by the desire of melters to fill their needs for third quarter in cases where they have consumed somewhat more iron than they had estimated.

Under present circumstances, southern iron has a decided price advantage. With iron available at $14.50, Birmingham, delivery can be made in Chicago and a considerable area outside the city at $18.50 per ton. Northern iron at the present firm price of $19 at the furnace and 35 cents switching charge is thus 85 cents per ton higher at the melter's side track. In cases where freight rates from Chicago are paid on northern iron, while the rate from Birmingham is the same as to Chicago, the advantage is even higher, running as much as $1.50 to points close to the Mississippi. This condition is being taken full advantage of by sellers of southern iron and they are booking such small tonnages as are now current.

In face of this competition, northern foundry iron of regular analysis is being held firmly at $19, Chicago furnace, and southern competition is being met by northern iron of southern analysis. The difference in phosphorus between northern and southern is relied on to preserve the differential at present existing between the two grades.

Sentiment is gaining force that scarcity of pig iron will be felt before the year closes and inasmuch as northern furnace interests have sold the larger portion of their last half production, they feel safe in remaining out of the market and maintaining the nominal quotation rather than quoting a lower price in a possible fruitless endeavor to stimulate buying. Shipments at present are slightly less than production and probably some northern iron will be piled during July. This will be due partly to inability of foundries to take in their full purchases on account of labor shortage, which is reducing the normal melt.

The excess of iron is also contributed to by the fact that every merchant furnace in the west is now in blast and producing at maximum capacity. No fear is felt that difficulty will be experienced in disposing of all

(*For complete prices see page* 100.)

this iron during last half as heavier demand is confidently expected before long.

Lake Superior charcoal and Jackson county silveries are nominally the same as for several weeks.

Mostly for Export

Philadelphia, July 10.—A slightly better volume of domestic sales in pig iron is being made, but the major portion of the going business has to do with foreign requirements. The French government has been the buyer of 5,000 to 10,000 tons of special basic from eastern Pennsylvania makers at a price understood to be around $20, furnace, and still is a receptive buyer of 10,000 to 20,000 tons of steel making grades for delivery during the next several months. Italy has closed with eastern makers for some further quantity of special low phosphorus 0.04 and under, including one lot of 2,000 tons at $30 to $31 furnace and probably 10,000 tons of this grade is represented in pending inquiries for that country. Canadian buyers have taken new lots of 2,000 and 1,000 tons respectively of low phosphorus metal in the east with additional tonnage asked for. A domestic buyer is in the market for several thousand tons of this grade. Several new sales of basic were made to eastern Pennsylvania consumers this week. A Lebanon, Pa., consumer took 4,500 tons for third quarter at around $19, delivered. Another sale of 3,000 tons for July-August delivery was made at the same figure and the buyer is understood to have been a Phoenixville plant which has been feeling the market with an inquiry for 1,000 tons. Another sale of 500 tons was closed at a low price. It is understood that the lower priced basic recently available from eastern Pennsylvania makers largely has been cleaned up and there is talk that $19.50, delivered, now is the minimum. Foundry iron sales hold to small amounts with prices continuing soft, at about $19.75 to $20.75, Philadelphia, for No. 2X. Virginia iron is unchanged at $18.50, furnace, for No. 2X. About 1,000 tons of Buffalo iron was sold in mixed lots in this district at $19.00, furnace. An inquiry for 450 tons of malleable is current. The Empire Steel & Iron Co. has blown out its No. 1 Crane furnace, but has lighted its Macungie stack. The Temple furnace may bank because of labor troubles. There is more unrest among eastern furnace labor.

Quiet at Pittsburgh

Pittsburgh, July 11. — Mid-summer dullness is reflected by the pig iron market in western Pennsylvania. Except for export, scarcely any inquiry exists for steel making grades, and foundry pig iron is not active. The American Iron & Steel Mfg. Co., Lebanon, Pa., recently inquired for 4,500 tons of basic iron for shipment the third quarter of this year, but the tonnage involved was not purchased in the valleys, so far as can be learned. The Colonial Steel Co., Pittsburgh, which inquired for 10,000 tons of basic iron, has not bought more than 3,000 tons. A manufacturer of sanitary ware continues to negotiate for 1,000 tons of No. 1 foundry for shipment in 1917. Numerous inquiries are coming out almost every day for bessemer iron for shipment to France and Italy.

Buffalo Sales 10,000 Tons

Buffalo, July 11.—The stacks of the Buffalo district booked orders in the past week totaling about 10,000 tons. While this placement is not large, it is a decided improvement on the record of the past few weeks. One order was for 3,000 tons of basic and another smaller tonnage was for the same grade. There is also an increase in the inquiry noted, covering generally lots of 200 to 500 tons of various grades of foundry and other irons. Most of the producers of the district report, however, that the market is passing through the customary mid-summer period of minimum activity.

There is little disposition on the part of the producers to seek new tonnages for their books, as they are generally sold up practically solid over an extended period. Any interest that appears is on the part of the consumers, as the furnace interests are bending their energies towards getting out iron under contract. Shipments on specifications are reported to be up to the limit of the railroads to haul out the cars and the equipment of the various merchant stacks of the district to load direct as cast and from their yard stocks.

Will Make Bessemer

Cleveland, July 11.—Dullness continues in the Cleveland district, but shipments last month were only a few thousand tons below production and there are no signs of weakness. The price situation will not be fully developed until a buying movement is started. The Struthers Furnace Co. expects to blow in its stack at Struthers, O., July 15, and will make bessemer pig iron in order to fill the order for 20,000 tons for export taken last week. Since it was blown out three months ago, the furnace has been relined and almost entirely rebuilt and will have a considerably larger capacity.

Demand Not Active

Birmingham, Ala., July 11.—Pig iron in the Birmingham district during the week past was not a much sought for article, partly due to the usual quietness which attends the advent and exit of the Fourth, but more largely to the fact that buyers continue to be satisfied with the tonnage of iron already contracted for. It has not been a hard task for the producers to figure that several of the large buying interests are yet very short of their full requirements for the last half of the year. At the same time, they apparently feel that any lowering of prices would only tend to prolong the waiting; consequently a majority of the producing companies are adhering to the $15 per ton price for the rest of the year, and one or two are quoting through the first half of next year at $15.50 per ton at the furnace. The increased storage charges on warrant iron seem to be worrying the holders somewhat, and occasional lots of this iron have been sold in eastern and middle western territory at prices ranging from $13.25 to $13.50 per ton at the furnace. Sales of iron during the week were exceedingly small, and inquiries were off compared with the week previous. One company last week quoted $15 per ton for last half delivery on 2,000 tons of iron, and another quoted the same price this week on a larger tonnage, but as yet sales have not resulted at that figure.

Stocks of iron, for the period ending June 30, show from 5,000 to 6,000 tons increase, but the total iron on yards at present is equivalent to only about 11 per cent of the present basis yearly output of pig iron in the district.

Warrants Stronger

New York, July 11.—Southern pig iron warrants for spot delivery are slightly stronger as additional sales at $13 at the warehouse in the Birmingham district for No. 2 seem to have absorbed most of the offerings at this figure. Buyers now are bidding $13 for No. 2 southern warrants, but holders are asking $13.50. There is a limited tonnage of No. 3 iron to be had in spot warrants on the basis of $13 for No. 2, although this is not pressing the market. Continued inquiry is coming out for future warrants. These offer little margin of advantage over furnace quotations for forward delivery when carrying charges are taken into account and there are few sales.

The Blackwood Foundry Co., Blackwood, N. J., is erecting an addition to its plant 50 x 60 feet, and a carpenter shop 14 x 16 feet, also is being built.

(*For complete prices see page* 100.)

Bar Buying for War Uses

Is Not So Active from England, But Russia Looks to the United States for Munitions—Domestic Demand Not Very Strong

Pittsburgh, July 11. — Some manufacturers of steel bars who have been furnishing rounds for shells say they would not be at all surprised if Great Britain withdrew from the American market. Announcement that there are 3,000,000 people making war material in England, as against 200,000 at the beginning of the war, leads to the belief that England not only can take care of her own armies, but assist those of her allies to a considerable extent. The Westinghouse Airbrake Co., which recently completed a contract for 1,250,000 18-pound shrapnel shells for the British government, may dismantle its machinery the latter part of this year, unless additional orders for shells are forthcoming. Russia, it is evident, is leaning upon American munition manufacturers for a large portion of her shells and other munitions. Furthermore, it is not unlikely that the United States government will buy war material at an early date; it is rumored that federal authorities already have placed contracts for heavy tonnages of war supplies.

Steel bars are held firmly at 2.50c for delivery at the convenience of the mill. It is significant to note that agricultural implement makers, who generally have no difficulty in obtaining concessions, have been unable to cover future requirements at less than the general market price. Iron bars are being quoted at a range from 2.65c to 2.75c.

Buying is Slow

Buffalo, July 11.—Mills and agencies of this district are getting in specifications on contracts closed at the beginning of the year, but buying generally is held up by the inability of the producers, particularly the large mills, to make any sort of definite promises of deliveries before the first and second quarter of 1917.

Producers report that the consumption of material is apparently as great as at any time in the past several months. In many development projects, the effort continues to have plans revised so as to use reinforced concrete in place of steel and stone or brick because of the prevailing price and scarcity of structural material.

Awaiting Market Developments

Philadelphia, July 10.—Consumers of steel bars in this district are not sending in specifications freely at present against the higher priced contracts they now have on mill books. Apparently they are waiting for the quarter to be more advanced and market conditions better defined before doing so. There are some cases, however, where buyers previously have anticipated their tonnage and have specified against contracts up to December of this year. New business is meager in volume. On the other hand, several of the makers are unable to take on any new orders for delivery under several months and they are offering only irregular lengths and sizes. Bessemer bars for early delivery still can be had from one or two makers at 2.50c, Pittsburgh, or 2.65c, Philadelphia. Very few new sales of shell steel for this year's delivery are being made, mainly because the material is not available since prospective buyers remain in the market.

Standing Pat

Cleveland, July 11. — Agricultural implement manufacturers are proving themselves to be "standpatters" in not contracting at the 2.50c price offered by the mills for the first half of next year. A manufacturer of a land roller in the northern part of the state has decided not to make that implement, as he cannot do so at a price at which the roller can be sold unless he can obtain steel at or below 2c, Pittsburgh. Manufacturers report that farmers are buying automobiles in large numbers and are postponing buying of farm implements on account of advances in prices. Bessemer bars are obtainable at 2.50c for prompt delivery. A Toledo manufacturer having a larger stock of reinforcing bars than he needs for his own requirements, is offering a considerable tonnage for sale.

Steel Demand Continues.

Chicago, July 11.—Demand for steel bars continues strong and the nominal quotation for delivery at convenience of mill remains firm at 2.69c, Chicago. Specifications are being received in large volume and in excess of shipments, while some new business is being booked for first half delivery with the provision that specifications must be made during last half.

Some selling for next year's delivery is also being done on definite projects and the aggregate of this business is a comfortable tonnage to be set against first half production. Independent steel makers are not taking first half business up to this time.

Hard steel bars re-rolled from rails are firm at 2.50c, and considerable new business is being booked.

Agricultural implement makers, with the exception of a few small tonnages, are not placing business for first half of next year, holding firmly that they cannot use steel bars at 2.50c, Pittsburgh.

(*For complete prices see page* 100.)

Bar Iron Steady.

Chicago, July 11.—Conditions in the market for bar iron remain firm and steady. Sales accompanied by specifications are being made at 2.35c, Chicago mill, while contracts for last half to be specified later are commanding 2.50c, Chicago mill. Not much of the latter business is being taken. Mills are already well sold and demand is balancing shipments sufficiently to keep rolliug schedules well filled sufficiently far ahead for comfort.

Hoops and Bands

Pittsburgh, July 11.—Demand for hoops and bands has not fallen off, although new buying is not nearly so heavy as it was a couple of months ago. Leading mills are offering hoops at 2.75c and bands at 2.50c for delivery at their convenience.

Shafting

Pittsburgh, July 11.—Shafting makers are asking from 15 to 20 per cent off the list for delivery the last three months of this year; some interests are refusing to shade 15 per cent. Specifications on contracts are heavy, but new buying is comparatively light, although consumers are manifesting interest in the market for 1917 shipment.

Billet Prices

Seem to be Hardening — Allies Need Shell Steel

Pittsburgh, July 11.—Scattering sales of semi-finished steel products the last few days have indicated that prices of billets and sheet bars are hardening. Some material has been sold at $45, mill, and that figure represents the bottom of the market, according to some sellers. On the other hand, some evidence of sales at $40, mill, still is found. An eastern Ohio manufacturer of sheets recently offered 6,000 tons of bessemer sheet bars for July delivery. Demand for wire rods is not nearly so heavy as it was a few months ago, but prevailing prices appear to be well maintained. No demand is reported for muck bar, consumers having covered requirements some time ago.

Brokers have been selling rather heavy tonnages of billets and sheet bars for export to Europe, sales the last 10 days involving from 20,000 to

25,000 tons, which commanded from $40 to $45, Pittsburgh.

Allies Need Steel

Youngstown, O., July 11.—Few sales of semi-finished material were made during the past week. Owing to the general closing down of sheet mills over the holiday period, some buyers who were short of steel expected to secure sheet bars held up by the idle mills. Their efforts, however, were unsuccessful. Occasional sales of small tonnages are made, prices varying from $40 to $45. Steel manufacturers here are taking deep interest in recent developments in the shell steel market. They point out that the allies originally sought contracts for complete shells. As the European factories became more highly developed, interest centered largely in forgings. In recent weeks, the demand has been mostly for shell steel. This development is taken here to indicate that the allies are rapidly approaching a self-contained position in the manufacture of shells, but it is not expected that they will be able to supply their enormous demand for raw steel.

Plates for Foreign Lands

Active Demand from Japan, England, China and Italy—Minimum Price Advanced

Philadelphia, July 10. — Some additional tonnage of ship plates has been booked by eastern makers for shipment abroad and the market is full of further inquiry for such countries as Japan, England, China, Italy and others. With the foreign demand so active, the market presents a strong front even though new domestic tonnage does not seem so liberal and prices are firmly established. Eastern mills continue to hold to a range of 3.75c to 4c, Pittsburgh, and 3.909c to 4.159c, Philadelphia. Consumers are specifying freely notwithstanding many contracts now are at top prices. Several of the Atlantic coast shipyards are engaged with labor troubles which are interfering with their operation, but they show no disposition to hold up plate deliveries. Such material as cannot be used at once is going into stock. A car builder has been in the market for a large tonnage and several thousand tons for bridges for the Pennsylvania and other roads are current. A pipe line in California requiring 5,000 to 6,000 tons has been before eastern makers, but it is believed this will go to Steel Corporation mills.

Minimum Price Advanced

Pittsburgh, July 11. — Steel plates, which have been the strongest item on the list for many months, continue to reflect strength. The naval program of the United States government, although still somewhat indefinite, is of great interest to manufacturers of plates in this district. Brokers continue to scour the market for material for export and from the specifications involved, it is obvious that tonnage is being purchased for Italy and Japan. Freight cars wanted by the Russian government will require tremendous tonnages of structural material, much of which likely will be purchased in Greater Pittsburgh. Plates for delivery at the convenience of the mill now are being held at a minimum of 2.90c, or $3 a ton above the price recently offered by one or two makers. For rather prompt delivery, eastern Pennsylvania manufacturers are quoting 4c, although that figure is being shaded in isolated instances. Plate manufacturers in western Pennsylvania do not appear to be worrying about the future, having enough tonnage on their books to continue present rates of operation the remainder of the year.

Shading Highest Prices

Cleveland, July 11.—The plate market is strong and it is very difficult to make contracts for delivery far into next year, but for prompt delivery, local mills which have been quoting 3.50c, Pittsburgh, on light plates are accepting desirable specifications at 3.25c, and leading independents are selling for prompt delivery at 3.75c. On the heavier plates, however, 4c is still the prevailing quotation. Eastern Pennsylvania plate mills are quoting 4.10c for delivery in six to eight months.

Steel Chain

Pittsburgh, July 11.—The market for steel chain is comparatively quiet. Material is being offered more freely at 5c than previously. The market, however, still is quotable at a range from 5c to 5.50c.

Nuts, Bolts and Rivets

Pittsburgh, July 11.—Structural rivets, for delivery at the convenience of the manufacturer, are being offered at 4c by some interests in western Pennsylvania. For delivery in the third quarter, 4.25c is being quoted by most sellers. Demand for nuts, bolts and rivets is described as heavy. Ship builders and car builders continue to play an important part in the market.

(*For complete prices see page* 100.)

Cast Iron Pipe

Very Few Public Lettings—Private Buying in Fair Volume

New York, July 11.—Perth Amboy, N. J., is taking bids tomorrow on 2,800 tons of 30-inch cast iron pipe, which is a contractor's letting. Other than this, there are no public lettings of size in this territory and as far as municipal work goes, the market remains very quiet. Private buying is keeping up a fair volume. Jersey City is closing today on 500 to 600 tons of 6 to 24's. The several hundred tons for Panama finally were awarded to southern shops, as there was an error in the original bid of R. D. Wood & Co., which was lowest. The Eastman Kodak Co., Rochester, has placed an order for something over 1,000 tons of 42-inch steel pipe, which completes the requirements of 5,000 to 7,000 tons, upon which it recently was negotiating. As previously stated, the remainder of the pipe which is to be cast iron went to the Warren Foundry & Machine Co. Cast pipe prices are steady.

Slow in West

Chicago, July 11.—Little demand is being made for cast iron pipe and nothing of importance was sold in the west during the past week. Some projects on which bids were opened are still under consideration without a decision having been reached.

Fair Business

Birmingham, Ala., July 11.—The manufacturers of cast iron water and gas pipe report a fair share of business was offered the past week. The American Cast Iron Pipe & Foundry Co. closed its plant the entire week, paying its men full time, and took the opportunity to make a few minor repairs. It will continue operations the coming week on full time. Prices are unchanged.

Royal Mattice, sales manager of the American Steel & Wire Co. at Cincinnati, has accepted a commission as captain of Company A, First Infantry, Ohio National Guard, stationed at Camp Proctor, near Cincinnati. Mr. Mattice has received instructions from the American Steel & Wire Co., stating that if he is called to duty on the Mexican border, the company will grant him leave of absence and will advance him his full salary while he is away.

Steel Awards

Do Not Represent Large Tonnage, But Small Jobs are Numerous

New York, July 11.—June made a light showing in the total of new structural steel awards, for, while the official figures have not yet been compiled, it is known that the amount was much below the average of other recent months. The quietness of June has been projected into July and the new tonnage now moving is of modest size. Small jobs are quite numerous and they supply most of the tonnage. Some of the railroads continue to place work with considerable activity, particularly the Pennsylvania, which has distributed 3,500 tons additional. The American Bridge Co., it now is settled virtually, will supply about 11,000 tons for three subway sections in the metropolis, upon which general contracts, but not the steel, were placed some weeks ago. There have been some additions to those mills which will accept plain material at 2.50c, Pittsburgh, or 2.669c, New York, for delivery at maker's convenience, and in some instances rather early shipment is being made. There are no signs of any prices under 2.50c, Pittsburgh.

Shapes Held at 2.50c

Pittsburgh, July 11.—Manufacturers of structural shapes in western Pennsylvania show no disposition to shade the prevailing 2.50c price for delivery at their convenience and it is predicted by some that that figure will represent the market the remainder of the year. New buying is comparatively light, but specifications against contracts have not fallen off to any appreciable extent. Rolling mills in the central west have been forced to slow down considerably this week on account of the hot weather.

Premiums Vanishing

Buffalo, July 11.—Mills here report that the only buying apparent at the present time is largely with the smaller mills, as these plants seem to be easing off on their premium prices for prompt deliveries, reducing their schedules to a basis more approximately to the prices of the larger mills. The latter are sold up over such a long period that they are making little or no effort to keep what current business there is in sight from going to the smaller plants.

More Active at Chicago.

Chicago, July 11.—Continued renewed demand for structural shapes marks the Chicago district and projects closed during the past week are in considerable number, although not involving large tonnage. The business continues to be mostly for industrial, railroad and public buildings, with an occasional mercantile establishment.

The 4,000 tons for the new plant of the Mark Mfg. Co. at Indiana Harbor are still pending. Prices remain steady and in addition to tonnages sufficiently large to be noted, the aggregate of steel going out in small lots is considerable.

CONTRACTS AWARDED.

Great Western Sugar Co., 6-story warehouse, Denver, Col., 368 tons to Omaha Structural Steel Co.

Stanislaus county, Cal., bridge over Tuelumna river near Modesto, Cal., 322 tons, to American Bridge Co.

American Brake Shoe & Foundry Co., extension to foundry, Chicago, 184 tons.

D. Rosenberg, department store, Evanston, Ill., 166 tons.

Municipal Pier, Chicago, tie rods and bolts, 142 tons.

Armour & Co., machine shop, cooling tower, condensor and extension to building "G", Omaha, Neb., 130 tons, to Paxton & Vierling Iron Works.

Elgin Joliet Eastern Railway Co., bridges, Joliet, Ill., 117 tons, to American Bridge Co.

Structural and re-inforcing steel for new power plant of Union Gas & Electric Co., Cincinnati, 800 tons, to the Cambria Steel Co.

Pomeroy and Wright, stores and offices building, Buffalo, 350 tons, to Buffalo Structural Steel Co.

St. Bonaventure College, Olean, N. Y., 100 tons for addition, to Kellogg Structural Steel Co., Buffalo.

Bridge work for the Pennsylvania railroad, 21 spans, 2,300 tons to the American Bridge Co.; 17 spans, 1,200 tons to the Pennsylvania Steel Co.

Trestle at Nesquihoning, Pa., for Lehigh Coal & Navigation Co., 400 tons to the Vanderstucken Construction Co.

Poli theater, New Haven, 600 tons to Harris Silvers Baker Co.

Bridge for the Southern railway over the James river 500 tons to the McClintic-Marshall Co.

Building for Niles-Bement-Pond Co. at Plainfield, N. J., 200 tons to Levering & Gerrigues.

Apartment for Convert Realty, Bridgeport, Conn., reinforced concrete design adopted. Originally figures to require 300 tons of steel.

Steel work for city pier at West Fifty-fifth street, New York City, 1,200 tons to the Pennsylvania Steel Co.

Steel work for subway section under Irving Place to Avenue B, Manhattan, 4,000 tons, to be furnished by American Bridge Co. Degnon Bros. general contractors.

Steel work for Section 4 of route 8 of the Fourteenth street subway line in Brooklyn, 3,500 tons, to be furnished by American Bridge Co.; Mason & Hanger Co. general contractors.

Steel work for Section No. 5 of route 8 of new subway line from Metropolitan to Bushwick avenue, Brooklyn, 3,700 tons, to be furnished by the American Bridge Co.; McArthur Bros. general contractors.

Two glass factory buildings, Clarksburg, W. Va., and Glassboro, N. J., 1,200 and 1,800 tons respectively, to the McClintic-Marshall Co.

CONTRACTS PENDING.

New York Central bridge, Himrod avenue, Youngstown, 700 tons; bids will be received this week.

Steel work for tunnel under the East River at Sixtieth street, New York City, for subway line, 1,700 tons; bids to be entered July 13.

Building at Bloomfield, N. J., for Sprague Electric Co., 1,000 tons, bids being taken.

Buildings for the Gilbert & Barker Mfg. Co., Springfield, Mass., 600 tons, bids being taken.

Municipal ice plant at Bridgeport, Conn., project abandoned.

Four bridges for Baltimore & Ohio railroad 400 tons; bids being taken.

Building for Carpenter Steel Co., Reading, Pa., 275 tons, bids being taken.

Highway bridge over the Susquehanna river at Athens, Pa., 500 tons, bids under consideration.

C. A. Simons Machine Co., Albany, N. Y., factory and machine shop, 100 tons, taking bids.

New Business Men's Club, Cincinnati, to cost $1,000,000; plans being prepared.

(*For complete prices see page* 100.)

Ferro is Easier

And the English Alloy is Offered at $175 for Prompt Delivery

New York, July 11.—Easier price conditions still dominate the ferro-manganese market and the small sales which are the units of the present trading, manifest the keener competition that prevails between English and domestic producers. There now are offerings of carloads and such amounts of English metal for prompt shipment at $175, seaboard; it is understood this same figure can be done on limited quantities for July arrival and there is no difficulty in obtaining it for later in the year delivery. As the market now appears, the premiums almost completely are off the earlier deliveries, and prices for either domestic or English ferro-manganese are settling to a more uniform figure for shipment up to and running through next year. Some English ferro-manganese which has been in stock at Baltimore for some weeks, was sold the past week and is understood to have gone at $175, seaboard.

There continues considerable diversity in the manner in which shipments are being received in this country from various English producers. As recently noted, at least two of the makers have been anticipating their obligations with consumers in this country. On the other hand, some producers are far behind in their deliveries and one of them shipped 1,500 tons less than the amount due during June. This variance in shipping conditions tends to make it more difficult to diagnose the future of the market. Very few inquiries for ferro-manganese now are current. One lot of 1,000 to 2,000 tons for export has been before sellers the past week.

Spiegeleisen is quiet and untested. While open quotations are from $50 to $55 furnace for 20 per cent, the

general indications are that this spread could be shaded on attractive business.

Are Very Independent

Philadelphia, July 11.—Brazilian manganese ore for next year's delivery now is held at 40 cents per unit at Rio Janiero, which at present freights means a rate of approximately 75 cents per unit at leading North Atlantic ports. Brazilian sellers are indifferent whether they book additional orders at this time, for their output is taken up heavily for the rest of the year. Indian manganese ore can be had for this year's shipment at 71 cents per unit at eastern seaboard, and it has been offered as low as 68 cents per unit subject to certain restrictions.

Prices Recede Moderately

Pittsburgh, July 11.—Prices of ferroalloys and steelmaking metals gradually are declining. Sellers of domestic ferro-manganese still are quoting $225, furnace, for spot, and $175 for future delivery, but English material has been offered at $175, seaboard, for prompt delivery. Prices of other alloys appear to be softer. Spiegeleisen, held at a range from $50 to $55, furnace, has reflected moderate weakness; the minimum figure has been shaded, it is reported. Steelmaking metals are quiet, but it is apparent that premium prices rapidly are disappearing.

Galvanized Sheets Lower

Decline in Prices is Expected to Arouse Interest of the Roofing Trade—Many Mills Resume

Youngstown, O., July 11.—Interest in galvanized sheets dominates the sheet market. Spelter's consistent decline, with the consequent softening of prices for the coated product, has brought the later to a price level which manufacturers believe will interest the roofing trade. Some manufacturers are now quoting 4.25c on the No. 28 base size, while others are holding at 4.35c and 4.40c. The irregularity of the market is shown by the fact that other manufacturers are holding for considerably higher prices.

The belief prevails here that prices will not decline to a much lower level. Black sheets are $25 to $30 a ton higher than when galvanized sheets rose in price in consonance with spelter's advance. Spelter, despite its drop, is 75 to 100 per cent higher than ordinarily. In addition, many manufacturers are still receiving higher priced spelter on older contracts and will not begin to get deliveries at present prices for four to six weeks. Mounting labor costs have added one cent to the cost of spelter, according to producers, while the same factor has enhanced the cost of mining zinc ore. These elements, coupled with the higher labor and supply costs faced by sheet mills since July 1, are the basis for the belief of galvanized sheet producers, that prices will not decline much further, if at all. The customary differential between black and galvanized sheets in ordinary periods is $1, against $1.25 at this time with black sheets at 3c and galvanized at 4.25c.

The roofing trade, customarily the bulwark of the galvanized trade, has been almost non-existent for months. Producers believe that an enormous demand has been banked up waiting for lower prices. Assured of high steel costs for some months ahead, the sheet mills are awaiting with interest the action of the roofing trade.

A fact, usually lost sight of in considering galvanized sheets, is that present quotations are largely due to increased prices for steel and not for spelter. The latter's influence is important, of course, but black sheets at 3.00c arbitrarily fix the range within which galvanized prices may move.

The market for black sheets is quiet, buying having been light for some weeks. The lull is seasonal, and renewed buying is expected in August. Blue annealed grades continue in good demand. No. 10 gage has been selling occasionally at 3.00c, although generally this size is held at 3.25c and one recent inquiry attracted a 3.35c quotation from one mill.

Most of the mills which shut down over the holiday period have resumed, after being out all last week. Needed repairs were made during that period. One mill, however, will not resume till July 17, taking this opportunity to make its first complete inventory in three years.

Sheets Strong, But Irregular

Pittsburgh, July 11.—No two buyers or sellers of steel sheets seem to agree about the position of prices. Differentials for the various gages show no uniformity. Irregularity, to a considerable extent, is ascribed to the fact that some mills, not engaged in a diversified line of business, have offered concessions in order to book tonnages. Others have been tempted, by prevailing low prices of spelter, to offer galvanized products at comparatively low prices. No. 28 gage galvanized sheets are being offered at 4.25c more frequently than previously. Black sheets are being held at 3c and as high as 3.10c by some manufacturers. Blue annealed sheets are decidedly strong; No. 10 gage is commanding 3.25c, although reports of sales at 3c are heard in isolated instances.

(*For complete prices see page* 100.)

Demand Quiet.

Chicago, July 11.—Not much demand is being experienced for steel sheets and both No. 28 gage black and No. 10 gage blue annealed remain at the former prices, 3.09c and 3.19c, Chicago mill, respectively. Some irregularity exists with wide sheets commanding a better price than narrow sizes. Galvanized sheets are lower, as spelter has declined.

Tin Plate Mills Busy

Pittsburgh, July 11.—Manufacturers of tin plate have received specifications for practically all the material purchased for delivery during the 1916 season. Leading mills are not in a position to promise additional tonnages and the threatened scarcity of tin plate probably will cause some embarrassment. Manufacturers are having no difficulty in selling material at $6 per base box and some tonnage has commanded as high as $7 per box. Production of tin plate has been reduced somewhat by the extreme heat of the last few days. Talk again is heard that manufacturers, when accepting contracts for delivery next year, will refuse to sell for delivery over periods more than six months long. Manufacturers for several years have been attempting to eliminate the long-term contracts.

Machinists' Strike

Is Causing Serious Trouble in the Philadelphia District

A general machinists' strike which is aimed at the winning of the eight-hour day and a higher hour rate, has assumed extensive proportions in some quarters of the Philadelphia industrial district and several important works have been forced temporarily to shut down completely. The strike was inaugurated about ten days ago and has been making considerable progress. The men are asking for the eight-hour day with ten-hour pay, time and one-half for overtime and double time for Sundays. The extensive development of the manufacture of munitions in the Phialdelphia district makes machinist trouble a factor of special importance.

W. S. Pilling, of Pilling & Crane, Philadelphia, has gone for a several weeks' automobile trip through New England.

Coke is Quiet

But Prices are Firm—Intense Heat Reduces Output

Pittsburgh, July 11.—The intense heat of the last few days has tended to reduce the output of Connellsville coke. Coke oven employes at many plants are refusing to work only part of the time. Shipments of blast furnace fuel to some plants have been somewhat uncertain and irregular. Forty-eight-hour coke for spot delivery is firmly pegged at $2.75, ovens. The market for contract coke, quotable at a range from $2.40 to $2.50, ovens, is quiet. Prices of foundry grades are unchanged in position. *The Connellsville Courier*, for the week ending July 1, says production was 423,550 tons, compared with 417,540 tons the week previous.

By-Product a Factor

Cleveland, July 11.—The coke market is quiet and the very few foundries that are not already under contract are finding that they can buy spot coke at less than the price called for by the contracts made by most of the foundries some time ago. By-product coke is becoming an increasingly important factor in this market and Rogers, Brown & Co. have been named sole agents for the by-product coke of foundry, furnace and domestic grades to be produced in ovens now being built at Terre Haute, Ind., by the Indiana Gas & Coke Co.

Foundry Contracts

New York, July 11.—Contracts for 10,000 to 12,000 tons of foundry coke for shipment to its various plants over the last half of the present year have been placed by the American Locomotive Co. The business went to various makers in western Pennsylvania.

Southern Prices Firm

Birmingham, Ala., July 11.—There has been no cessation in the operation of all the coke ovens in the district to their capacity for months, and the demand for this product continues especially brisk. Prices are firm and coke is scarce at any price. Following prices obtain, per net ton f. o. b. cars at the ovens: Foundry coke, $4.25 to $4.50 per ton; furnace coke, $3.25 to $3.50 per ton.

Inquiries at Cincinnati

Cincinnati, July 11.—Inquiries for spot shipment for furnace coke have been coming into this market, but dealers report that only a light tonnage is being sold. Several southern furnaces are expected to put out inquiries in the near future for fuel requirements over the last half of this year. The southern coke market has rallied somewhat from the depressed state it was in two weeks ago. No demand is in sight for foundry coke, but shipments on this grade on old contracts are very good. Wise county and Pocahontas foundry coke are quoted from $2.85 to $3.25, ovens, and New River furnace coke from $3.25 to $3.50, ovens, all for contract delivery.

Ore Receipts

At Lower Lakes and Shipments to Furnaces Are Heavy

Receipts of iron ore at lower lake ports during June were in line with the great total movement for the month. Out of a total of 9,705,576 gross tons of iron ore shipped on the Great Lakes during June, 7,823,704 tons were delivered at Lake Erie ports, including Detroit, as follows:

	Gross Tons		
Port	1916	1915	1914
*Buffalo	1,248,874	636,990	440,172
Erie	134,004	42,075	53,467
Conneaut	1,623,599	1,386,048	1,143,049
Ashtabula	1,682,482	946,437	977,358
Fairport	426,628	263,842	207,051
Cleveland	1,563,662	859,393	914 285
Lorain	659,420	596,293	363,219
Huron	197,693	96,785	104,447
Toledo	233,857	67,125	114,945
Detroit	53,485	46,684	65,052
Total	7,823,704	4,941,672	4,383,045

*Includes receipts at Port Colborne.

The total ore on dock July 1 was 3,983,197 tons, compared with 6,120,524 tons on July 1, 1915. The shipments from lower lake ports to furnaces during the month amounted to 5,698,128 tons.

The receipts at South Chicago last month were 1,180,368 tons, and at Gary, 317,148 tons.

Far Out of Line

Philadelphia, July 11.—On the basis of three charters for zinc ore just made from Greece, Algeria and Sardinia, which were at the rate of 25 to 35 shillings per ton, it is apparent that Mediterranean iron ore could not be laid down at Atlantic ports in this country under 12 to 14 cents per unit. Such a price manifestly is prohibitive, but it illustrates how far out of line with domestic ore, the foreign mineral now is because of the high level of ocean freights. Some of the eastern furnace interests continue to conserve their stocks of pig iron in view of a possible falling behind of their shipments of lake ore.

Predict 60,000,000-Ton Movement

Cleveland, July 11.—Iron ore shipments are now going forward so rapidly that some leading vessel men are predicting a movement of 60,000,000 tons. The labor situation, on the ranges, is improving and many men are coming back to work. The railroads in handling ore from mines to upper lake docks and lower lake docks to furnaces are doing their part in a highly satisfactory manner. It is expected that the shipments to eastern furnaces will amount to about 3,000,000 tons this year.

Men Return to Work

Duluth, July 10.—The Mesabi ore range strike is practically over and the men are returning to work. The net result of the occurrence consists of three men killed, two severely injured, and nearly 30 per cent of the underground miners of the range have gone to fields where the I. W. W. is not so active, thus curtailing underground activities for the season. Three strike leaders are in jail at Duluth charged with murder, and numerous subordinates are incarcerated on other charges. The governor of the state was obliged to order summarily Sheriff Meining to do his duty. Meining's former attitude is regarded as largely responsible for the length and seriousness of the strike. All efforts to extend the strike to the Cuyuna range and the Duluth ore docks were squelched by the firm attitude of authorities who maintained their initiative.

Big Pipe Order

Is Received by a Mill in Western Pennsylvania

Pittsburgh, July 11.—A mill in western Pennsylvania has received an order for 45 miles of 12-inch steel gas line pipe for shipment to Huntington, W. Va. No other orders of importance have been placed in the open market. The establishment of prices on oil country goods for shipment to new points in the Kentucky oil field has become general. These prices were announced a week ago by the National Tube Co.

Specifications against contracts are heavy. Most mills are not in a position to assume additional obligations for delivery this year. Prices of boiler tubes, to a considerable extent, are nominal, most sellers asking from two to four points above prevailing prices.

The Western Reserve Steel Co., Warren, O., has moved into its new office building adjacent to its works. The building has two stories and basement, and is of brick construction. The two upper floors are given over to private and general offices. The basement contains a private and a general dining room for employes.

(*For complete prices see page* 100.)

Scrap Bought at Pittsburgh

Causes Stir in Other Centers—Large Tonnage Obtained in the East—Decline Seems Halted

Pittsburgh, July 11.—The general iron and steel scrap market, after many weeks of inactivity, shows signs of considerable strength. The Carnegie Steel Co., as previously reported, has bought from 30,000 to 50,000 tons of heavy melting material at prices ranging from $16.50 to $17.25, and the Jones & Laughlin Steel Co. is reported to have taken about 30,000 tons of melting steel. A fortnight ago, this grade was quoted at $15.50. Other stocks are correspondingly stronger, and it is not unlikely that further advances will be registered. Demand for both turnings and borings is rather heavy. Blast furnace managers are using much scrap in an effort, it is believed, to conserve ore stocks as much as possible.

Market is Firmer

Buffalo, July 11.—Dealers of the Buffalo district report that within the past week the market has experienced a firming up tendency. There is more buying reported in a number of the lines and particularly in heavy melting steel for users in the Pittsburgh and valley districts. The improvement is noted generally through the list, but not enough to cause any stiffening in prices.

The general impression prevails that the market will continue to improve in activity, but no changes in prices are affected within the near future.

Stronger at Cleveland

Cleveland, July 11. — Compared with conditions a week ago the scrap market presents an entirely different front, as it now has something to act in its support. The activity in the Pittsburgh district in heavy melting steel has had influence to make the local appearances change in this manner, since a considerable portion of the steel will move from this district during the next seven weeks. It can hardly be said that activity in other grades of scrap has materially increased. They simply have taken a stronger position due to the increased strength of the leader of the list, heavy melting steel. Mills here are holding back on buying and offer not more than $14.50 to $15 for heavy steel. Busheling is weak on account of embargoes at leading consuming points. Other grades of scrap are comparatively inactive. The market is expected to gain strength gradually, but most observers do not think the market will see the extensive rise that accompanied the last big buying movement which prevailed last March.

Chicago Scrap Stronger.

Chicago, July 11.—Sentimental strength following heavy buying by the leading interest has caused many brokers to hold their material for better prices. It develops that the buying for the Gary plant totaled 30,000 tons and that $14.50, delivered, was paid, sellers having the option of delivering heavy melting steel, shoveling steel or rail steel.

Although no buying has been done in rolling mill grades, they are held at 25 to 50 cents per ton higher than last week as a result of steel buying.

Railroad lists are more numerous, but do not contain heavy tonnages. The Union Pacific railroad offers 2,500 tons, the Kansas City Southern railroad, 100 tons, the Missouri, Kansas & Texas railroad, 1,500 tons, the Belt Railway of Chicago 400 tons, the Wabash railroad 2,900 tons, the Southern railroad 4,000 tons, the Monon railroad 500 tons, and the Chicago, Milwaukee & St. Paul railroad 1,500 tons.

Lifeless at St. Louis

St. Louis, July 11.—The scrap market in this district is dull and lifeless, and virtually no business is being transacted. Consequently, quotations are really nothing more than estimates of values. However, it is believed that the bottom has been reached, and prices are not expected to go lower during the summer. Consumers have not made any purchases for some weeks and there is very little trading even among dealers. Relaying rails continue to be the only strong feature of the second-hand material market, and they are still in good demand.

The only railroad offerings before the market this week are Mobile & Ohio, 900 tons; Chicago, Indianapolis & Louisville, 500 tons; Wabash, 2,750 tons; Baltimore & Ohio, 16,000 tons.

Inquiries at Cincinnati

Cincinnati, July 11.—A few good inquiries that have come into the iron and steel scrap market have failed to give it any life. Youngstown melters are asking for prices and deliveries on good tonnages of heavy melting scrap, having been attracted to this district by the low prices that prevail here. Heavy melting scrap is quoted from $13.50 to $14 per gross ton, f. o. b. Cincinnati, the latter figure being dealers' selling price. An eastern user will buy cast borings to the extent of $25,000, but has been unable to find a local dealer who can supply that amount. The local quotation on that grade is around $6 per net ton.

(*For complete prices see page* 100.)

Covering Pittsburgh Orders

Philadelphia, July 10.—Active buying by brokers, particularly at eastern neutral points, to fill the large orders for heavy melting steel by the Carnegie Steel Co. has been the market's principal activity and the better tone to conditions noted a week ago has been extended. Eastern consumers, however, have been no more active and remain indifferent. The eastern scrap trade understands the total purchases of steel scrap of the Carnegie Steel Co. were about 100,000 tons and at least 15,000 to 20,000 tons of the metal for these orders were obtained in the east. One broker covered 10,000 tons in the east. On some of this material $16.50, delivered, was paid and since the best offers for eastern Pennsylvania consumption are $15.00 to $15.25, delivered, the drawing power of the Pittsburgh prices from neutral plants is manifest. Some phosphorus is obtainable in fair lots at lower figures, but in the main the decline in prices seems to have been halted.

Some Low Prices

New York, July 11.—Except for the buying here of heavy melting steel by Pittsburgh brokers who have been covering on the large orders recently placed there, the scrap market has continued dull and heavy. For Pittsburgh delivery $16.50, delivered, or about $13.70, New York, has been offered and paid. This is higher than is obtainable for eastern Pennsylvania delivery. Eastern buyers have been offering even lower prices. Turnings have been sold at $17, New York, and lower, for eastern Pennsylvania delivery. There are offers of $26, delivered, for steel axles for western Pennsylvania delivery.

Sheets From Warehouse Lower

Cincinnati, July 11.—A few warehouses are offering sheets at lower prices. No. 10 blue annealed can now be had from 3.40c to 3.50c, and black No. 28 gauge from 3.25c to 3.40c. Galvanized No. 28 are unchanged at 5.25c. Cold rolled bars are holding at 10 plus the list price, and hot rolled bars are given from 3.20c to 3.75c, all of the above prices being f. o. b. Cincinnati. Warehouses are unable to supply the demand for twisted reinforcing bars. Business on other materials is reasonably good.

Stupendous Rail Order

Placed by Russia Represents an Expenditure of Many Millions—Orders for Locomotives Still Pending

New York, July 11.—Final distribution now made to American mills of the large rail order for the Russian State Railways marks the consummation of probably the most stupendous single contract of its kind ever placed in this or any other country. The gross tonnage of 67½-pound rails and accessories closed for amounts to from 425,000 to 450,000. This division gives to the Steel Corporation mills about 200,000 tons, as previously announced; to the Cambria Steel Co. approximately 150,000 to 160,000 tons, and to the Lackawanna Steel Co. 75,000 tons. The Bethlehem Steel Co., it is understood, will roll some of the rails under a sub-contract with one of the producers receiving an award. The American Steel Export Co., New York City, which handled 80,000 tons of the order, placed this business with the Cambria Steel Co. The American International Corporation, which had the placing of 150,000 tons, divided this amount between the Lackawanna Steel Co. and the Cambria Steel Co.

The average price obtained for the rails, which are to be both open-hearth and bessemer, and the accessories was from $51 to $52 alongside New York or from $49 to $50 at the mill, representing a total cost to the Russian government of from $22,000,000 to $23,000,000. The rails are to be delivered by July, 1917. The present export rate on rails from Pittsburgh to New York is $1.84 per ton, but this is raised to $2.76, the full domestic rate Oct. 1, when the export tariffs are abolished and all the tonnage will be shipped at the higher figure, from which the railroad will profit heavily. This heavy new tonnage added to the large rail business now on the books of American makers means that it will be impossible to accept any new rail orders of size for shipment before midyear of 1917.

The Russian railways now are moving more actively toward the closing of the large car order, for which they have been negotiating for some months. This, it still is believed, will amount to about 30,000 cars. Some large negotiations calling for many thousand axles and steel wheels for the repairing and re-equipping of present rolling stock, are understood to have been closed with manufacturers in this country within a few days. Details yet are to be announced. Final orders for the 1,000 Russian locomotives are still anticipated.

Domestic car business continues very light. The Delaware & Hudson is negotiating for 1,000 hoppers and another eastern road has come out for 1,500 box cars. A report that the Erie railroad has bought 2,500 cars additional is incorrect and refers to contracts originally placed some months ago and now in course of manufacture. Some round tonnages of track supplies and accessories are being placed by domestic roads and the striking fact regarding these is that the prices are from $25 to $30 a ton above those that prevailed two years ago.

Extensive Plans

Cleveland, July 11.—The purchase of the Nickle Plate railroad by O. P. and M. J. Van Sweringen and associates, of Cleveland, is expected to result ultimately in a large amount of new construction. The plans of the Van Sweringens, who purchased the Nickle Plate in order to obtain desirable terminal facilities, include electrifying of rapid transit lines extending to Painesville on the east and Elyria on the west, a distance of 50 miles. The same interests, as previously reported in these columns, have contracted for the building of a hotel on the site of the present Forest City House, and will also erect a freight terminal, union passenger station and other buildings. It does not seem probable, however, that the plans will take definite shape for several months.

Rail Sales Light

Chicago, July 11.—Business in both standard and light section steel rails is light from domestic sources, although a steady business is experienced in small lots of both open hearth and bessemer, most of which cannot be delivered until next year. Demand for light rails is slack from domestic sources of this business.

Large tonnages for export rails in both standard and light sections have been taken recently by the leading interest and much of this material will be rolled near Chicago and shipped in various directions. Material intended for South America will move to gulf ports and that for the Orient will go by way of the Pacific ports, while some of the business will go to the Atlantic and a European destination.

Some buying of moderate tonnages of track fastenings continues and most interests find their production for the remainder of this year practically sold out.

New Car Inquiry

Chicago, July 11. — Several inquiries for freight cars and car building material have come out recently in this market. The Illinois Central Railroad is asking figures on 500 refrigerator cars, the Texas Pacific Railroad, on 100 gondolas and the San Pedro, Los Angeles & Sale Lake, on 300 automobile cars. The Rock Island Railroad is asking prices on 30 steel underframes, the Northern Pacific on 300 draft sills and the Burlington Railroad on 1,000 center-sills.

The Russian government continues in the market for freight cars and since the recent credit loan was completed, the business appears to be nearer closing than for some time. In fact, the situation looks sufficiently alive to cause leading car builders to send representatives to Petrograd in an effort to land part of this business, which is said to total 15,000 cars.

(*For complete prices see page* 100.)

Very High Wages

Paid to Puddlers—Record of a Half Century is Broken

Youngstown, July 12.—Examination of bar iron sales for the past two months in the Western Bar Iron Association shows that the 1.85c price prevailing entitles puddlers to $8.40 per ton. This is the highest rate that has been paid for boiling since November, 1866, when $9 was received for a period of 30 days under a sliding scale. At that time bar iron sold for $112 a ton, or double the price now received by manufacturers.

The wages of mill employes are also to be advanced. Sheets have been selling at $2.60, which is 13½ cents above base, or a 6 per cent advance over the former prevailing rates. Tin plate has advanced from $3.70 to $3.90 and a 4 per cent increase is added to the 4 per cent allowed in the new scale.

Will Meet in Detroit

Officers of the Amalgamated Association of Iron, Steel and Tin Workers and representatives of bar iron manufacturers in the central west will meet at Detroit July 18, in an effort to agree upon wage scales for the year ending June 30, 1917. At the conference recently held at Atlantic City, scales proposed by the Amalgamated association, providing advances of about 15 per cent, were rejected.

Export Record

Made in May, When Over Half Million Tons Were Shipped

Exports of iron and steel products for May were far in excess of April, the total tonnage being 540,580, compared with 384,917 in April and 438,054 tons in March. The total for the 11 months ending with May was 4,327,649 tons, compared with 1,645,250 tons for the 11 months ending May, 1915. The largest increases made in May compared with April were in scrap, pig iron, semi-finished material, steel rails, steel bars, sheets and plates, tin and terne plate, wire products and pipes and fittings.

Exports of machinery for April show that the value of motor trucks was the greatest with the exception of February of any month since September of last year. Exports of metal working machinery made a new record, the value being $6,552,397.

Imports of manganese ore show a heavy increase, the total for May being 74,825 tons, compared with 16,645 tons in May, 1915.

Exports of zinc, except ore and dross, were valued at $3,677,375 in April, compared with $1,885,464 for the same month last year. Machinery exports in April were valued at $17,526,899, compared with $10,399,716 in April, 1915. No aeroplanes were exported in April, as compared with 46 in April, 1915, valued at $318,492.

IRON AND STEEL EXPORTS, GROSS TONS.

	May,		Eleven months ending May,	
	1916.	1915.	1916.	1915.
Scrap	24,889	1,050	138,842	22,550
Pig iron	28,293	18,581	237,958	108,483
Billets, ingots and blooms of steel	142,782	48,391	845,781	171,417
Wire rods	15,683	11,236	153,480	80,302
Steel rails	48,841	16,646	492,038	122,040
Steel bars	77,667	37,170	564,111	171,818
Iron bars	7,364	2,394	64,462	10,071
Struc. iron and steel	22,938	14,072	244,874	145,812
Hoops, band and scroll	3,280	1,578	37,248	13,088
Sh'ts & plates	45,129	34,249	448,979	242,749
Tin and terne plates	25,584	7,217	200,718	72,426
Barbed wire	39,195	19,521	326,739	124 802
All oth. wire	22,664	18,718	221,181	118,598
Cut nails	614	376	4,049	2,227
Wire nails	12,204	6,459	111,509	45,291
All oth. nails, includ. tacks	745	725	8,567	4,189
Pipes & fit'gs	17,005	22,180	160,194	159 962
R. R. spikes	1,960	264	24,306	4,883
Bolts, nuts, rivets & washers	2,494	1,272	28,687	12,019
Horseshoes	1,051	865	11,756	10,060
Cast radiators	198	144	2,170	2,463
Total	540,580	263,109	4,327,649	1,645,250

IRON ORE IMPORTS, GROSS TONS.

	May,		Eleven months ending May,	
	1916.	1915.	1916.	1915.
Spain	26,261	9,705	89,871	62,086
Sweden	22,306	6,745	203,845	174,141
Canada	16,292	3,504	100,635	40,339
Newfoundland & Labrador	.....	.....	.....	17,500
Cuba	66,550	58,220	751,949	678,401
Oth. countries	17,190	20,800	145,265	102 072
Total	148.599	98,974	1,291,565	1,074,539

EXPORTS OF MACHINERY.

1915.	Motor trucks.	Agricultural implements.	Aeroplanes.	Metal working machy.
June	$8,578,802	$854,670	$283,212	$3,735,562
July	6,803,001	963,534	880,836	3,872,358
Aug.	4,387,193	1,454,606	588,600	3,624,411
Sept.	5,882,255	1,092,797	101,950	3,256,973
Oct.	4,307,190	791,230	366,892	3,236,079
Nov.	3,837,307	1,054,235	13,770	4,644,713
Dec.	3,920,533	1,338,629	156,347	3,205,788
1916.				
Jan.	3,416,818	1,139,874	.....	3,249,595
Feb.	6.170,367	1,323,578	22,320	4,662,905
Mar.	4,909,179	2,287,605	8,400	6,501,022
Apr.	5,259,480	2,066,512	.....	6,552,397

IMPORTS AND EXPORTS.

1915.	Imports, gross tons.	Exports, gross tons.
July	20,858	378,890
August	27,556	405,850
September	23,345	381,914
October	34,730	351,039
November	37,131	362,764
December	35,456	353,836
1916.		
January	15,824	354,416
February	20,279	368,869
March	26,212	438,054
April	20,176	384,917
May	106,939	540,580

IRON AND STEEL IMPORTS, GROSS TONS.

	May,		Eleven months ending May,	
	1916.	1915.	1916.	1915.
Scrap	6,407	2,221	92.144	29,834
Pig iron	10,067	18,581	104,291	108,483
Manganese	74,825	16,645	430,620	175,843
Ingots, blooms & bil'ts of steel	4,843	1,008	21,748	23,826
Wire rods	434	487	4,126	4,340
Rails	9,196	13,434	49,233	38,046
Bar iron	909	233	6,990	9,620
Structural	67	19	1,305	5,525
Sheets and plates	152	82	1,618	2,459
Tin & terne plate	39	24	711	4,676
Total	106,939	52,734	712,786	402,652

Barbed Wire

Russia in Market for Large Tonnage—Plain Wire Stronger

Pittsburgh, July 11. — The Russian government, which closed for about 175,000 tons of barbed wire and staples several weeks ago, now is actively negotiating for 150,000 tons of barbed wire, orders for which likely will be placed at an early date. Plain wire relatively is stronger than nails. Many mills have withdrawn quotations below $2.65 for wire; that figure is $4 a ton above the prevailing nominal price. The domestic market is quiet, so far as new buying is concerned, but specifications continue active.

Will Have New Warehouse

Chicago, July 11.—As interesting evidence of Detroit's increased importance as a center of steel consumption comes the announcement that Joseph T. Ryerson & Son have prepared the way for Detroit warehouse development by purchase of a suitable industrial site. The property consists of about three acres in the Milwaukee junction district and is one of the few remaining vacant sites having the double facilities of both Grand Trunk and Michigan Central direct trackage.

(*For complete prices see page* 100.)

Unfilled Orders

Steel Corporation Shows Decrease as Buying Slackens

The first break in ten months is the record of increases in the unfilled tonnage of the United States Steel Corporation occurred during the month of June, when, according to the monthly statement issued at New York July 10, the total orders dropped 297,340 tons below shipments. Some reduction had been anticipated, as it was evident that the crest of the buying movement which had increased the order book of the Steel Corporation approximately, 5,000,000 tons in nine months had been reached. In view of Judge Gary's recent statement that shipments were about 51,000 to 51,500 tons daily, it is apparent that new business in June averaged about 36,500 to 37,000 tons daily. The total orders on hand June 30, were 9,640,458 tons.

The unfilled orders of the Steel Corporation at the close of each month in recent years, showing the changes in tonnage and per cent are as follows:

Date.	Total.	Change, tonnage.	Change, per cent.
June 30, 1916	9,640,458	297,340—	3.09—
May 31, 1916	9,937,798	108,247+	1.11+
Apr. 30, 1916	9,829,551	498,550+	5.34+
Mar. 31, 1916	9,331,001	762,035+	8.89+
Feb. 29, 1916	8,568,767	646,199+	8.16+
Jan. 31, 1916	7,922,767	119.547+	1.53+
Dec. 31, 1915	7,803.220	616,731+	8.58+
Nov. 30, 1915	7,189,489	1,024,037+	16.63+
Oct. 31, 1915	6,165,453	847,834+	14.06+
Sep. 30, 1915	5,317,618	409,163+	8.13+
Aug. 31, 1915	4,908,455	20,085—	0.04—
July 31, 1915	4,928.640	250.344+	5.35+
June 30, 1915	4,678,196	413,598+	9.69+
May 31, 1915	4,264.598	102.354+	2.46+
Apr. 30, 1915	4,162.244	93,505—	2.21—
Mar. 31, 1915	4,255.749	89,622—	2.06—
Feb. 28, 1915	4,345,371	96,800+	2.28+
Jan. 31, 1915	4,248.571	411.928+	10.74+
Dec. 31, 1914	3,836,643	512.051+	15.40+
Nov. 30, 1914	3,324,592	136,505—	3.94—
Oct. 31, 1914	3,461,097	326,570—	8.62—
Sep. 30, 1914	3,787,667	425.664—	10.01—
Aug. 31, 1914	4,213,331	54.742+	1.32+
July 31, 1914	4,158,589	125,732+	3.12+
June 30, 1914	4,032,857	34.697+	0.86+
May 31, 1914	3,998,160	278,908—	6.98—
Apr. 30, 1914	4,277,068	376,757—	8.09—
Mar. 31, 1914	4,653,825	372.615—	7.42—
Feb. 28, 1914	5,026,440	412,760+	8.95+
Jan. 31, 1914	4,613,680	331,572+	7.74+
Dec. 31, 1913	4,282,108	114,239—	2.59—
Nov. 30, 1913	4,396,347	117,420—	2.60—
Oct. 31, 1913	4,513,767	490,018—	9.79—
Sep. 30, 1913	5,003,785	219,683—	4.24—
Aug. 31, 1913	5,223,468	175,888—	3.03—
July 31, 1913	5,399,356	407,965—	7.03—
June 30, 1913	5,807,317	517,005—	8.18—
May 31, 1913	6,324,322	654,440—	9.38—
Apr. 30, 1913	6,978,762	490,194—	6.55—
Mar. 31, 1913	7,468,956	187,758—	2.45—
Feb. 28, 1913	7,656,714	170,654—	2.18—
Jan. 31, 1913	7,827,368	104,796—	1.32—
Dec. 31, 1912	7,932,164	79,281+	1.01+
Nov. 30, 1912	7,852,883	258,502+	3.40+
Oct. 31, 1912	7,594,381	1,042,874+	15.33+
Sep. 30, 1912	6,551,507	388,132+	6.29+
Aug. 31, 1912	6,163,375	206,296+	3.46+
July 31, 1912	5,967,079	149,773+	2.58+
June 30, 1912	5,807,346	56,363+	0.98+

Eight New Boats.—Contracts have been closed by the Pusey & Jones Co., Wilmington, Del., for the construction of four 300-foot steel cargo steamships and also of four schooners, which will be fitted out with auxiliary power. The company has just laid the keel for a yacht for H. E. Dodge, of Detroit, which will be over 200 feet in length.

Pig Iron Prices

Are Important Features of the British Market at Present

Bureau of *The Iron Trade Review*,
Prince's Chambers, Corporation St.,
Birmingham, Eng., June 30.

Attention in the raw material department now is concentrated on the question of prices which, under the new regime, are under the control of the government. Wherever possible, new contracts are being held over until a decision has been arrived at by the ministry of munitions on the question, submitted from the various iron-making centers, as to whether a fairly substantial advance in selling prices shall be permitted at the beginning of July. The strongest possible pressure has been brought to bear, and in some directions the applicants have taken care to ask for enough.

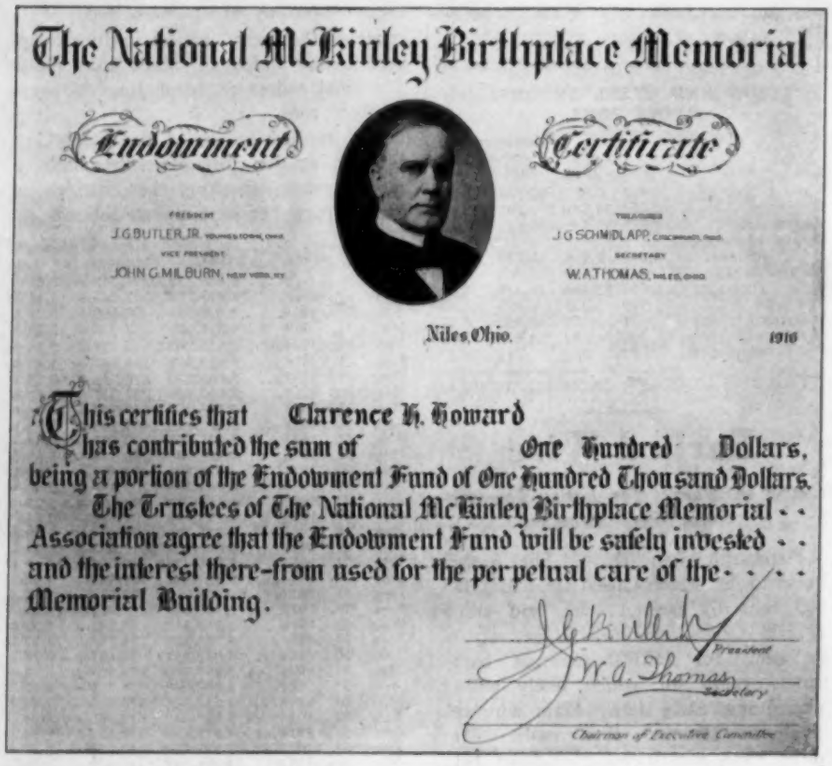
For example, some makers of good Staffordshire brands are asserting that unless an advance of 10s ($2.40) per ton is permitted, they will close down their furnaces. Any possibility of such an advance would seem to be remote, and it is even rumored that a refusal to make any advance at all is not impossible. But it seems that a rise of 1s 6d (36c) per ton on coke has been allowed, which adds to the cost of pig iron production something like 2s 6d (60c) per ton.

For Cleveland iron the quotations are 82s 6d ($19.80) to home consumers. For export sales about 7s 6d ($1.80) is added. Makers in the North of England have in view a likely increase in price, in their rather extensive preparations to increase production, by starting up furnaces.

Very little export business is in progress, and none is accepted unless the shipper is already in possession of the requisite licenses. These are now dealt out very sparingly, but the total shipments keep up fairly well, those to date reaching 24,000 tons, while warrant stock has decreased 3,000 tons. The amount in store is now 29,000 tons. It is very difficult to buy iron of any kind in the North of England, makers having so little to dispose of. This applies also to East Coast hematite, most of the makers being sold to the end of the year. The quotation for home consumers is 122s 6d ($29.40) and for export 140s ($33.60). There is an overwhelming demand for the special irons produced on the western coast.

The finishing mills in that district are increasing at a greater pace than the blast furnaces; but strong efforts are being made to prepare other furnaces, and 27 in all are now in operation. Others are being prepared for the autumn.

(*For complete prices see page* 100.)


The National McKinley Birthplace Memorial

Endowment

Certificate

J. G. BUTLER, JR.

JOHN G. MILBURN

J. G. SCHMIDLAPP

W. A. THOMAS

Niles, Ohio. 1916

This certifies that Clarence H. Howard has contributed the sum of One Hundred Dollars, being a portion of the Endowment Fund of One Hundred Thousand Dollars. The Trustees of The National McKinley Birthplace Memorial Association agree that the Endowment Fund will be safely invested and the interest there-from used for the perpetual care of the Memorial Building.

President

Secretary

Chairman of Executive Committee

ENDOWMENT CERTIFICATE ISSUED TO CLARENCE H. HOWARD, PRESIDENT, COMMONWEALTH STEEL CO., ST. LOUIS

Souvenir Coins

Will Complete Memorial Building-Fund —Endowment Needed

The National McKinley Birthplace Memorial Association, Youngstown, announces that with the sale of the 100,000 souvenir gold coins authorized by congress it will have enough money to complete the McKinley Birthplace Memorial building, at Niles, O., but it will be necessary to have an endowment fund in order to take care of the building and the grounds for all time to come. The association has asked 500 individuals, firms and corporations, friends of the martyred President, to subscribe $100 each to this fund and has already received a number of subscriptions. The association has prepared and is ready to issue an etching 11 x 14 inches, including a halftone engraving of McKinley, as shown in the cut on this page. The name of each donor and the amount contributed will be filled in on this certificate.

Heavy Rains Do Much Damage

Birmingham, Ala., July 11.—Over 12 inches of rainfall have fallen in the district the past few days—the hardest rains since 1876, so some of the old residents say. Much damage was done. The Republic company had to bank two of its furnaces for a day or so, and the Sloss-Sheffield company's North Birmingham furnaces had some high water from the creek nearby. Many of the coal mines and ore mines have been flooded by great quantities of water, but nothing serious happened. Mobile was hit the hardest in the state, and the Pratt Co. and the DeBardeleben Coal Co., coal miners at Birmingham, sustained some severe losses in the harbor to their tugs and barges. They handle coal down the Warrior river to the Gulf of Mexico.

Making a Fight

Washington, July 12. (By wire.)—Western senators are making a strong fight before the sub-committee of the finance committee on the copper tax proposal in the omnibus revenue bill. It is believed the provision will either be greatly revised or entirely eliminated from the measure.

The Union Steel Casting Co., Boston, whose plant was destroyed by fire on June 10, has leased the foundries of the G. W. & F. Smith Iron Works, in the Roxbury district, Boston, which have sufficient capacity to supply all the needs of the Union Steel Casting Co.'s trade.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

WHILE a complete official announcement of the changes to be made in the sales organization of the Bethlehem Steel Corporation enlarged by the amalgamation of the Pennsylvania Steel Co. yet is to be made, some of the personnel of the new force have become generally known to the trade. R. W. Gillispie, who has been general manager of sales of the Pennsylvania Steel Co., has become assistant general agent, with headquarters at South Bethlehem. Paul Mackall, who has been western sales agent of the Bethlehem Steel Co., with headquarters at Chicago, also has been made assistant general sales agent and will be located at South Bethlehem. R. E. Belknap, district sales manager of the Pennsylvania Steel Co., at New York, becomes western sales agent of the Bethlehem Steel Co. at Chicago, where he formerly was located as district sales manager of the Pennsylvania Steel Co. John M. Ellis, who has been New York sales agent of the Bethlehem Steel Co., remains in that capacity in charge of the sales in that district of the two companies. Official announcement of a number of other changes is expected in a few days.

A number of members of the firm of Rogers Brown & Co., have allied themselves with military organizations in answer to the call of the United States government, regarding the present crisis on the Mexican border. Standish Meacham, assistant sales manager and advertising manager, and Robert D. Meacham, traffic manager of the above company, both of the Cincinnati office, have gone to the United States military training camp at Plattsburgh, N. Y., to take a full course of military training. George Sullivan, sales manager at Philadelphia, has joined the Merion Rifle Association, and Cecil E. Bertie, salesman, Philadelphia, has joined one of the regiments of the national guards in that city. Ralph W. Clark, head salesman, and Heath E. Noble, both of the New York office of the company, are now on the Texas border with the Fourteenth Regiment, New York national guard. W. S. Rogers, of Buffalo, son of W. A. Rogers, president of the Rogers Brown Iron Co., and Harold T. Clement, assistant to the treasurer of the company at Buffalo, together with Chester D. Shepard, also of the Buffalo office have gone to the border with Troop I, New York national guard.

J. D. Reen, Turners Falls, Mass., has accepted a position as mechanical engineer with the E. B. Badger & Sons Co., Boston.

Edward F. J. O'Connor, Worcester, Mass., has accepted a position as assistant to the works engineer of the Hyatt Roller Repairing Co., Harrison, N. J.

Wallace R. Johns has been appointed manager of the machine tool department of Somers, Fitler & Todd Co., Pittsburgh. He has been connected with the company for the past 11 years.

Wm. T. Todd Jr. has been added to the selling force of Somers, Fitler & Todd Co., Pittsburgh, Pa. Mr. Todd is a graduate of Cornell, having received the degree of mechanical engineer in the class of 1916.

Robert J. Spence has resigned as instructor in the machine department of the Worcester, Mass., Boys Trade School, to accept a position in the educational department of the Norton Co., in the same city.

Gordon J. Ely has resigned as manager of the employment bureau of the Stanley Works, New Britain, Conn., to become active secretary of the Manufacturers' Association of that city.

George Brooke III, member of the Brooke family, of Birdsboro, Pa., which is prominently identified with the iron industry, has gone to the Mexican border as a member of the First City Troop of Philadelphia. He is a son of Edward Brooke.

John Bennett Bissell, formerly president of John Bennett Bissell, Inc., exporter, has resigned to become connected with the Blaw Steel Construction Co., Pittsburgh, as manager of the export and eastern structural sales departments. Mr. Bissell will be located at the company's New York offices, 165 Broadway.

Walter Davidson, head of the Harley-Davidson Motor Co., Milwaukee, one of the largest manufacturers of motorcycles in the world, left New York July 1, for England to spend two months or more in research work in Europe. The Harley-Davidson company has shipped hundreds of motorcycles to the allied nations of Europe for war purposes, and is still working on large orders.

Homer D. Williams, president of the Carnegie Steel Co., and Charles E. Dinkey, general superintendent of the Edgar Thomson Steel Works of the Carnegie company, have taken an active interest in the advancement of the community welfare movement at Braddock and other mill towns in western Pennsylvania, and a series of educational motion pictures is being given this summer in Braddock and North Braddock, Pa.

Dr. William O'Neil Sherman of Pittsburgh, will represent the United States Steel Corporation in the research work outlined by the Rockefeller Institute in the base and field hospitals of the allied armies of Europe. Dr. Sherman is chief surgeon of subsidiary companies of the Corporation in the Pittsburgh district. He will work in Europe under the direction of Dr. Alexis Carrel, head of the Rockefeller Institute.

J. K. Eaton, a machinery merchant of Johannesburg, South Africa, is in New York, after having visited the principal industrial centers of the United States. He is making his headquarters at the offices of Bowering & Co., 17 Battery place, New York, and plans to remain here about another month. One of the projects Mr. Eaton has under consideration is the installation of a steel foundry in South Africa. He is desirous of securing a process in which scrap steel alone may be used as the raw material, since pig iron must be imported in South Africa and costs about $70 a ton, thus resulting in an excessive cost for castings.

Equipment Company Changes Hands

The plant of the Coleman Foundry Equipment Co., Cleveland, has been purchased by Julius Tuteur and the firm name has been changed to The Foundry Equipment Co. Mr. Tuteur has had a wide experience as a manufacturer, having formerly been president of the Columbian Hardware Co., the Duplex Hanger Co., and the Republic Structural Iron Works, Cleveland. The company will specialize in the making of equipment for gray iron, malleable, brass and steel foundries. The plant is located at 2102 to 2118 Abbey avenue.

Coke Plant

Of Youngstown Sheet & Tube Co. Will Soon be Placed in Operation

Youngstown, July 10.—The Youngstown Sheet & Tube Co. expects to get its new by-product coke plant in operation at Struthers within the next few days. The work of drying out the ovens commenced two weeks ago and has been progressing nicely at the several batteries since the fires were first lighted.

L. H. Underwood, who came to the Youngstown Sheet & Tube Co. from the United States Steel Corporation works, at Gary, Ind., is the superintendent who will have jurisdiction over the retort ovens, 204 in number, erected by the H. Koppers Co. Included in the plant is a benzol works. The gas from the plant will be used in the mill of the Sheet & Tube company, while the tar, ammonia, etc., will be taken care of by the Barrett company that is constructing a fine plant in Poland avenue on the south side of the Mahoning river.

Just as soon as trade slacks up a little, or when the furnace equipment begins to give an indication of wear, the Ohio Iron & Steel Co. will reline Mary furnace at Lowellville, O. Nearly all of the material is on hand, so that if the stack were blown out, it could be improved and relined in short order. It was originally intended to construct a plate shell to melt the iron while the stack was being rebuilt, but inability to secure material caused a change in these plans.

Work is progressing nicely on the new No. 5 bessemer stack of the Republic Iron & Steel Co., at Hazelton, a suburb of Youngstown. The W. B. Pollock Co.. has the contract for the plate work.

Another Million

Will Be Expended on Improvements By Bethlehem Steel Co.

Another extensive enlargement of the steel-making capacity of the Saucon plant at South Bethlehem has been decided upon by the Bethlehem Steel Co. and the work of construction has been begun. The new capacity will consist of three additional 20-ton converters in the bessemer department, one 1,500-ton hot metal mixer and two 200-ton tilting open hearth furnaces. This additional equipment will provide a new duplexing unit, the output of which will be devoted toward meeting the increased requirements of the structural, rail and other rolling mills of the Saucon plant. It is estimated that the improvements will represent an outlay of about $1,000,000. In the blast furnace group, the work of converting stack B. from a 200 to a 500-ton unit has been inaugurated.

Hospital Addition

Pittsburgh, July 11. (By wire.)—The contract for an addition to Mercy hospital, Pittsburgh, has been awarded to the Jones & Laughlin Steel Co. The contract involves 1,000 tons.

New Forging Plant

Operations have been inaugurated in the new forging plant of the Worth Bros. works of the Midvale Steel & Ordnance Co., Coatesville, Pa., which has been under construction for several months. One 1,500-ton press is in service and a 2,500-ton unit of the same type soon will be started.

Investigation

Of Steel Corporation Abandoned by Federal Trade Commission

Washington, July 12. (By wire.)—The interstate commerce commission this morning vacated the order of June 10, 1912, for a comprehensive investigation of the Steel Corporation and its relations to railroads as to the effect on rates in official classification territory on raw materials and finished products of the steel trade and the cement industry. The dropping of this case brings to an end one of the most exhaustive investigations ever proposed by the commission.

The Non-Ferrous Metals

Copper **Lead** **Spelter** **Tin**

"THE accomplishment of the mining industry in the six-month period just completed," said Director Smith, of the United States geological survey, in summing up his official mid-year review, "warrants the forecast that 1916 is to be a record-breaking year."

The special reports on the mining industry, which now are being made public by the survey, although to a large extent as was expected by the trade, are proving highly interesting in their detail and are serving to substantiate the predictions of unparalleled prosperity made earlier in the year.

According to these reports, copper is continuing the steady increase in production which began early last year, and the forecast for 1916 indicates not only the largest output ever known, but also the largest profits. Arizona, no doubt, will maintain first place as a copper producer.

In lead and zinc, the mines are producing ore at a rate even exceeding that of last year and the prevailing prices have made possible the working of large quantities of low grade ore. The reports of all states indicate that the production of zinc ores in the first six months of 1916 was at a rate of 25 to 30 per cent larger than that of 1915.

The shipments of sphelerite concentrates from the Joplin region during the first half of the year amounted to about 180,000 tons, valued at more than $17,000,000, as against 296,000 tons valued at $23,419,000, in the calendar year of 1915. Unless the base price declines to a point which will prevent the mining of lean "sheet ground" the production of zinc concentrates from the Joplin region in 1916 probably will be 60,000 to 70,000 tons more than in 1915.

New York Market

New York, July 11.—The metal markets generally continue to reflect a very poor demand and a reactionary price tendency. The weakness in spelter continued pronounced last week and yesterday. Today there was a slightly better inquiry and a firmer tone developed for a time, but this afternoon there again were numerous cheap sellers. Prime western may be quoted as follows: Prompt 8.50c to 8.75c, St. Louis; July, 8.25c to 8.50c; August, 8c to 8.25c; September, 7.87½c; last quarter, 7.50c to 7.75c. Brass special spelter is quoted at 9c to 10c, St. Louis, for prompt shipment.

The only activity in copper is in the outside market and there is so little demand that second hands continue to find it necessary to reduce their prices to attract buyers. Electrolytic may be quoted as follows: Prompt and July, 25.50c to 26c, cash; August and September, 24.50c to 24.75c, cash; October, November and December, 24c to 24.50c, cash. Prime lake is quoted at around 26.25c, cash, for prompt shipment. Ordinary casting copper is quoted at 23.50c to 23.75c. cash, for spot.

The lead market continues dull and prices in the outside market continue to tend toward lower levels. Spot prices are fairly firm, but material concessions could be had on futures. D silverized for prompt shipment continues to be held at a premium of $1 to $2 a ton above the market. The outside market may be quoted at 6.35c to 6.45c, New York, and 6.20c to 6.30c, St. Louis. The American Smelting & Refining Co.'s price is 6.50c, New York, and 6.42½c, St. Louis.

The tin market has been featured by a poor demand. The premium on spot practically has disappeared for the time being and spot, July and August all are quoted at approximately 38.50c, New York. September is quoted at about 38.25c.

The antimony market continues to reflect a sagging price tendency, although there is an improved volume of business. The market on spot is quoted at 15c to 15.50c, New York. There is practically no demand for futures.

The outside aluminum market is quoted lower. No. 1 virgin in carload lots for prompt shipment are quoted at 58c to 60c. No. 1 remelted at 56c to 58c, and No. 12 alloy at 46c to 48c.

(*For complete prices see page* 100.)

How to Conduct Fire Brick Tests

USERS and manufacturers of refractory fire brick have long felt the need for standard methods of testing. These tests, to be serviceable, should be adaptable to the finished brick. The authors give in this article the results of an investigation to develop tests that would imitate conditions of actual practice

BY C. E. NESBITT AND M. L. BELL

THE use of refractory material in metallurgical operations is one which, as a rule, is given but very general consideration. The selection of a suitable refractory calls for a study, first, of the temperatures involved, and second, of the nature of the hot material and resulting slag to which the refractory will be exposed. Refractories are generally used in form of bricks or blocks which are moulded from materials in the plastic condition, then burned. The resulting product is a solid of sufficient mechanical strength to permit its use for various forms of construction. The two most common raw materials for making refractory bricks are clay and a variety of silica called ganister. Other raw materials are gradually finding wider and more general use, but these two continue to be the important ones.

Clay and silica rock suitable for bricks are widely distributed, but nature has very largely determined their physical properties. Each of these materials has varying physical properties which may be taken advantage of and incorporated into the finished bricks, the quality of which is largely dependent on the methods employed in their manufacture.

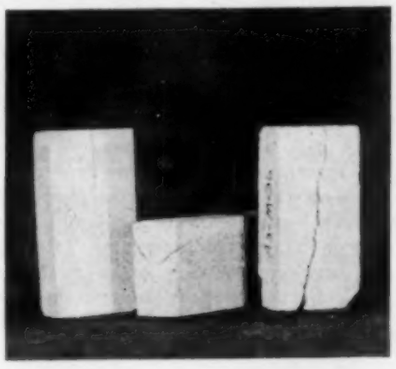


FIG. 1—IMPACT TESTS ILLUSTRATING CHARACTERISTIC FRACTURES

In its simplest terms a furnace or heating chamber consists essentially of a shell of brick work sometimes bound together with a suitable frame work of iron. Owing to various physical, chemical and mechanical operations which take place in the furnace the refractory must meet certain demands to give a satisfactory life. No brick can be expected to be best in all physical properties, and it becomes necessary to select the brick which is best suited to withstand that particular condition imposed by the furnace. It may be that the brick will have to withstand the abrasive action of heavy, hard materials, the sudden fluctuation of temperature, the corrosive action of slag, or the action of load while at high temperatures. These and similar points should be considered, their relative importance determined and the brick chosen should be the one best suited to resist that particular condition.

FIG. 2 — SLAG PENETRATION AND ABRASION ON SILICA BRICK—PORTION OF AN 18-INCH BULKHEAD

In the iron and steel industry the blast furnace is one of the most important types of furnaces. In simple terms, it is a hollow steel cylinder, approximately 100 feet high and some 28 to 30 feet in diameter, lined with fire brick. In a furnace of 500-ton capacity, about 1,900 tons of ore, limestone and coke are used every 24 hours. These materials, often wet or frozen, are fed in at the top and fall on the materials already in the furnace or roll over against the walls. Since this material must pass slowly through the furnace the wear on the lining is extremely heavy. The temperature at the top of a blast furnace is low, but as the charge descends the temperature increases until the fusion zone is reached. In this zone the hard material composing the charge becomes a pasty mass which ultimately is melted and the brick work then has to withstand molten iron and slag rather than abrasion or impact.

No blast furnace is complete without its battery of stoves, in which no metallurgical operations take place. The object of the stove is to absorb heat rapidly and then as quickly give it up. Here a brick must withstand sudden thermal changes, abrasion, slagging, due to the dust carried by the burning gas, and possess good heat-absorbing qualities.

In one of the processes of converting pig iron into steel, a basic open-hearth furnace is used. This furnace is built up largely of silica brick, although the hearth is made up of basic materials because of the basic character of the slag, while the regenerators are of fire brick. Silica bricks are very sensitive to thermal changes, but owing to their infusibility and their ability to withstand heavy loads when highly heated, they are used almost without exception in open-hearth practice. Any variation in the method of manufacture which will tend to decrease the sensitiveness of silica bricks to heat changes, without sacrifice of their other good qualities, will directly increase the life of the furnace and materially lessen furnace shut-downs.

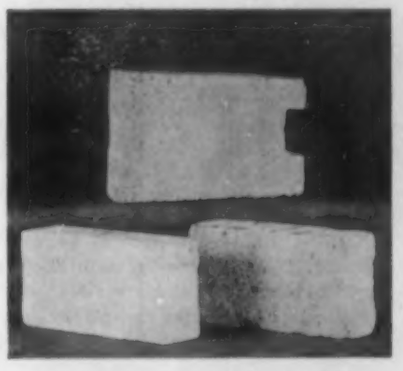


FIG. 3 — ABRASION TESTS, SHOWING DIFFERENCE IN DEPTH OF CUTS IN UPPER BRICK

Presented at the Atlantic City, N. J., meeting of the American Society for Testing Materials, June 27-30.

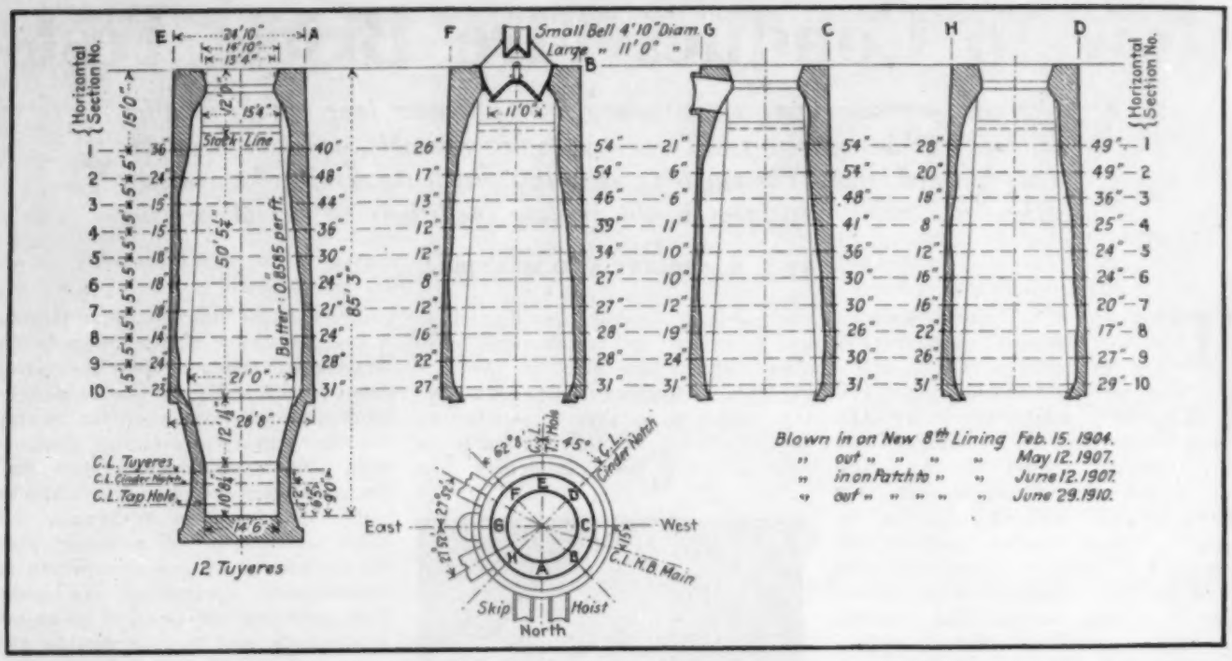


FIG. 4—VERTICAL LINES OF EROSION ON A BLAST FURNACE AFTER SIX YEARS' SERVICE—UNIFORM WEARING

Note.—The letters E, A., etc., represent vertical sections taken on the diameters shown in the plan; the figures 1, 2, 3, etc., shown at the left and right, designate the horizontal sections, which are shown in Fig. 5. The figures on the outside of the vertical sections represent the thickness of the brick lining remaining at these points

In all soaking pits, heating furnaces, annealing furnaces, mixers, ladles, etc., the temperatures are not as high as in the open-hearth furnace; the brick work here has mainly to withstand the action of the molten metal, iron scale or slag. A general review of the conditions imposed on fire brick as used about iron and steel plants has pointed out two general conclusions: (1) the life of a furnace is determined by the life of its brick work, and (2) different furnaces demand different physical properties in the brick used.

Description of Tests

A great many investigators have attacked the problem of refractories, the work having been done mainly from the standpoint of the inherent physical properties of the raw materials. The results are of high technical excellence and have been of value. In the majority of cases, however, the tests have not been applicable to brick as received by the consumer. He could not go out to his stock, select several bricks and quickly determine their value for his particular purpose.

With this idea in mind each of the various conditions where fire brick are used was studied to determine the cause of failure. The next step was to imitate actual conditions of service in the laboratory. This meant that tests must be employed which were very severe, producing in a short time what in actual service might require months or even years to accomplish. To test brick cold and say that the result of the cold test was a measure of the performance when hot, did not seem justifiable. Another point was to make the tests such that the work could be done on the brick as received, and not on bricks prepared for the test.

In the study of service conditions, attention was first directed to the top of the blast furnace. The average temperature at the top is about 260 degrees Cent. The charging of a furnace is a nearly continuous operation, the material charged falling on the large bell, which when lowered allows the material, often wet or frozen, to slide off the bell and strike the walls of the furnace. Immediately the charge starts slipping and grinding its way slowly downward past the brick in the wall. These conditions required tests that would imitate impact, abrasion and spalling.

Impact Test

An impact test was first considered. The rattler and other similar tests were studied, but it was finally de-

FIG. 5—CHARACTERISTIC SPALLING TEST SPECIMENS

FIG. 6—SPALLING IN ROOF OF AIR FLUE OF OPEN-HEARTH FURNACE

FIG. 7 — CHARACTERISTIC SLAG TEST SPECIMENS

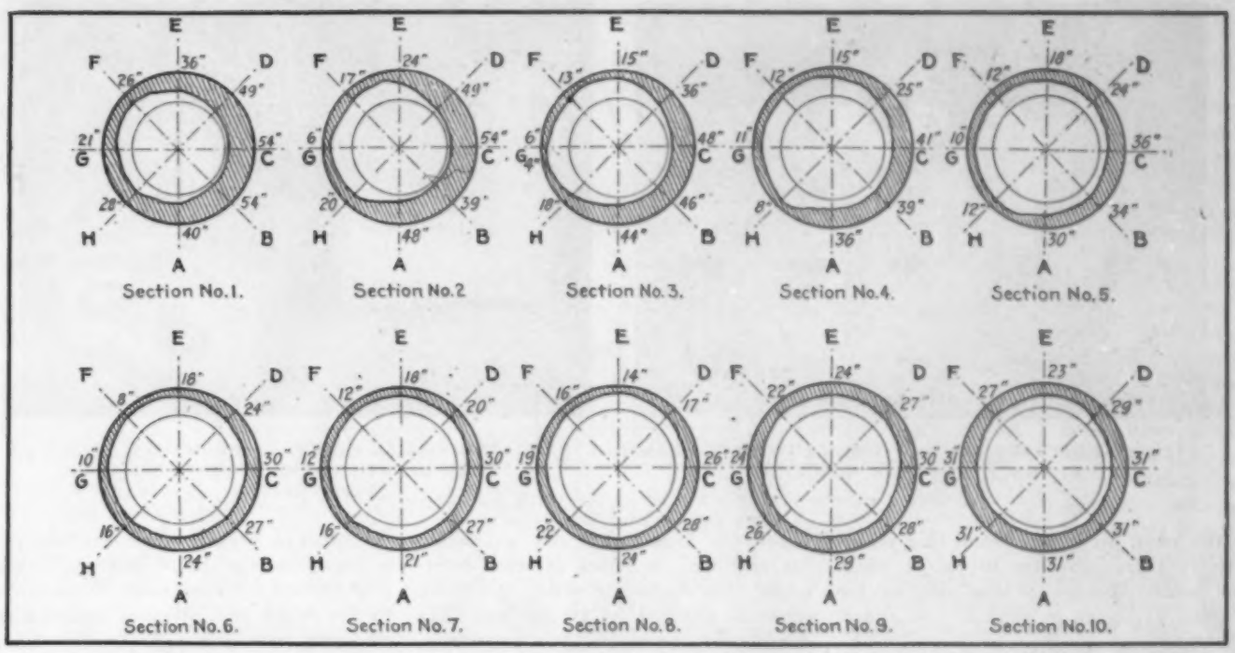


FIG. 8—HORIZONTAL LINES OF EROSION ON A BLAST FURNACE AFTER SIX YEARS' SERVICE—UNIFORM WEARING

Note.—The letters at the ends of a diameter refer to the corresponding section indicated in the plan view of Fig. 4. The figures at the ends of a diameter indicate the thickness of the brick lining remaining at the ends of that diameter. For example: Horizontal section No. 1 shows thicknesses at the ends of the diameter EA equal to 36 and 40 inches; at the ends of diameter FB, 26 and 54 inches, etc. These figures will also be found along the horizontal line of section No. 1 in Fig. 4.

cided that some kind of a drop test would be the most practical, and would most nearly approach service conditions. After trying many shapes and sizes of falling weights it was finally decided to use a steel ball 2½ inches in diameter. The brick was heated to 260 degrees Cent. and the ball allowed to drop on the end of the brick from a height of 2 inches, then 4 inches, and so on, until the brick broke. The height to which it was necessary to raise the ball to cause fracture of the brick represents a particular quality, namely, resistance to impact.

The comparative strengths of brick to resist impact at ordinary temperatures and at slightly elevated temperatures are interesting. A brick heated to 260 degrees Cent. and tested was 20 per cent weaker than a brick of the same brand tested at 20 degrees Cent., and 40 per cent weaker when tested at 540 degrees Cent. Characteristic fractures are shown in Fig. 1.

Abrasion Test

In developing an abrasion test it was found that others had abraded brick in the cold by means of an emery wheel. This idea was modified so as to test the brick while hot. A temperature of 260 degrees Cent. was adopted for top-wall and pipe brick and 1,350 degrees Cent. for all others. The reason for choosing 1,350 degrees Cent. for the high temperature was that (1) it is a comparatively easy temperature to reach with a test furnace, and (2) while it might not represent the highest temperature in the furnace, it is above the melting point of cast iron and is applicable to all high-temperature furnaces used about iron and steel plants.

The brick to be tested was heated to 1,350 degrees Cent. and then pressed against a carborundum wheel, pressure and time being constant. When the brick became cold the depth of cut was measured and the result reported as linear inches abraded in 5 minutes. This test developed the interesting fact that bricks are not always the same at

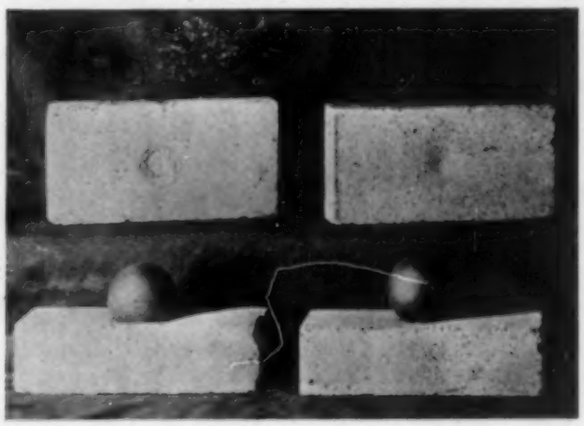


FIG. 9—CHARACTERISTIC COMPRESSION TEST SPECIMENS, SHOWING DEPTH OF BALL AND CORRESPONDING IMPRESSIONS

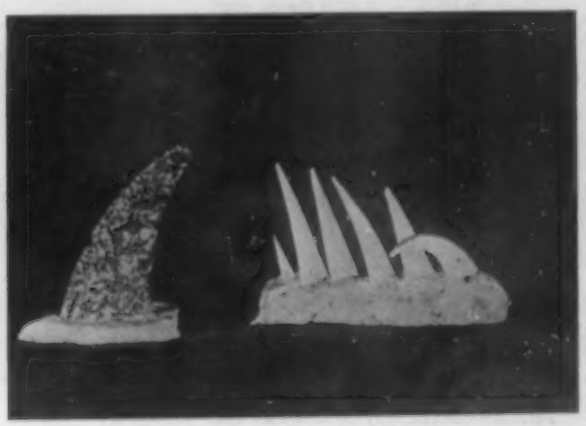


FIG. 10—CHARACTERISTIC SOFTENING TEST SPECIMENS

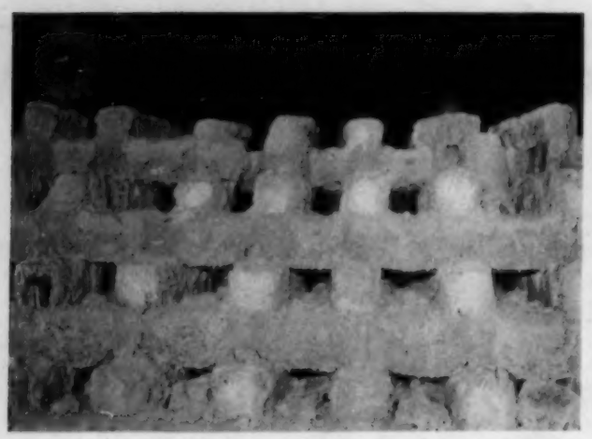


FIG. 11—CHECKERS IN GAS CHAMBER OF OPEN-HEARTH FURNACE, SHOWING SLAGGING

FIG. 12—INDIVIDUAL CHECKERS FROM GAS CHAMBER OF OPEN-HEARTH FURNACE, SHOWING SLAG PENETRATION

both ends, for it was found that sometimes there may be 10 to 20 times as much abrasion at one end as the other, as shown in Figs. 2, 3, 4, and 8.

Spalling Test

Spalling was next studied. In brick work such a condition is usually the result of thermal changes, often accelerated by mechanical pinching. In actual service only one surface, generally the end or side of the brick, is exposed to the direct action of heat.

After trying various tests it was decided to place the brick to be tested in the wall of the furnace so that only one end was exposed. The testing temperature was 1,350 degrees Cent., and after a series of experiments as to the most satisfactory time for heating, one hour was decided upon, with 25 minutes cooling in a blast of air. To produce a measurable spall at least 30 operations of heating and cooling were required. This was too long, and it was decided to increase the severity of the test by cooling in water for 3 minutes, and so hasten the spalling. A series of tests determined that cooling in water was three times as effective as air cooling. The number of operations was accordingly cut down to 10. The amount of spalling is reported as the percentage loss in weight. This test applies only to fire brick. Figs. 5 and 6 show characteristic examples of spalling.

Slagging Test

The failure of brick work due to the corrosive action of slags is more prevalent than from any other cause. Not only is slag action marked in blast furnaces, but also in open hearths, cupolas, and heating furnaces, and to a lesser degree in mixers, ladles, fireboxes, etc.

During the development of a slag test the slag was first placed on the surface of the brick. It was next confined by the use of kaolin rings, but both tests were unsatisfactory. To confine a comparatively large portion of slag to any one portion of the brick it became necessary to drill a cavity in the brick and place the slag therein. Experiments were made to determine the effect of fineness of the slag, time of exposure to heat, and the effect of destroying the surface texture by drilling. To measure the slag penetration the brick is cut through the pockets of the slag and the area of brick penetrated by the slag measured with a planimeter. Figs. 7, 11 and 12 show test and service specimens, which illustrate the action of slag.

Compression Test

The ability of brick work to stand up under loads when highly heated is of great importance. A comparative test consisting of a modified Brinell ball test was used by heating the brick to 1,350 degrees Cent., removing from the furnace and then forcing a 2½-inch steel ball into the brick under a pressure of 1,600 pounds. The depth of the impression was then measured when cold. Figs. 9 and 13

FIG. 13—SPALLING ACCELERATED BY COMPRESSION OF ENTIRE CORNER OF AIR FLUE IN OPEN HEARTH FURNACE

FIG. 14—GAS AND AIR PORTS INSIDE OF OPEN HEARTH FURNACE, SHOWING SLAGGED CONDITION OF WALLS AND ROOF AND DISAPPEARANCE OF BRICK AROUND WATER COOLER IN FOREGROUND

show the method of testing and the effect of compressive action. Expansion, contraction and fusibility are important qualities of fire brick. For these tests the usual methods were followed. Figs. 10 and 14 show typical examples. As a result of a large number of tests following the methods outlined, it was found that fire bricks tended to group themselves according to density. In general, bricks of high density, all other factors being equal, have the most desirable qualities, namely, least abrasion, good resistance to slag and least compression. Spalling is very slightly increased but not to a dangerous extent if bricks are not over-burned.

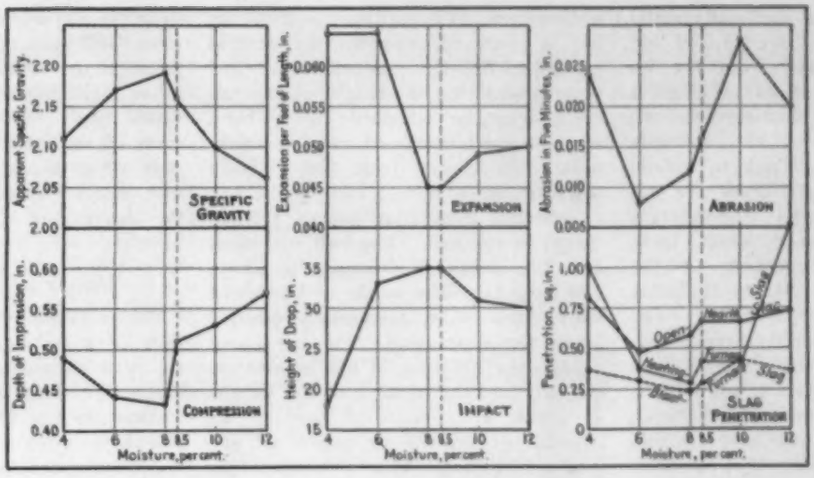


FIG. 15—INFLUENCE OF WATER, USED IN MANUFACTURE, ON PHYSICAL PROPERTIES OF FIRE BRICK

As a measure of density, the apparent specific gravity is used—obtained by weighing and measuring the brick and not by suspension, as is usually done. Results show that various makes of brick have characteristic values for apparent specific gravity and that the method of manufacture greatly influences the density. A series of preliminary experiments had shown the importance of pressure and moisture in producing a dense brick, and this test was followed up by a more elaborate series. A standard fire-clay mixture was used, in which the moisture was varied from 4 to 12 per cent, and all bricks were pressed at 2,000 pounds per square inch, then burned in a regular kiln. The results of tests applied on this series are shown in Table I and in Fig. 15 .

Power-pressing a brick during manufacture up to 1,500 pounds per square inch has been found to materially improve the quality of most fire brick; beyond that figure very little improvement is made. A comparison of tests on a high-pressure, low-moisture brick and a hand-made, repressed, ordinary-moisture brick, both brick of the same mixture, is given in Table II.

The laboratory methods suggested have been developed mainly with reference to bricks to be used in iron and steel plants. When modified they are applicable to almost any condition of service to which the bricks will be subjected. If a brick is to be used in a boiler setting, copper or lead smelter, calcining or roasting furnaces, the test should imitate these conditions, in order that the results be comparative. Conditions of service must be studied to learn what is demanded of a brick. When a laboratory test has been developed it must be confirmed by actual service tests. To compare the life of two similar furnaces built of different materials, or even the same furnace built of different materials at different times, does not necessarily mean that the material showing the longest life is the better, since the operating conditions may have been decidedly different. Conclusions can only be drawn when all conditions except brick quality are the same.

To derive the greatest benefit the consumer and manufacturer must work together. The manufacturer's interest must not cease with the shipment of his product. The consumer should provide all reasonable facilities for the manufacturer to study his product in actual service. It is only by such co-operation or exchange of information that the best results can be obtained.

At the present time the following machines and apparatus described are in a state of development and while they have been standardized for the test, the machines and methods themselves are not necessarily final.

The machine for determining the resistance to impact consists of two vertical uprights 15 feet high, supporting two vertical and parallel 1½-inch angle irons. The angle irons are

Results of Tests of Refractory Fire Brick

Table I

TESTS ON FIRE BRICK OF VARYING MOISTURE CONTENT

Properties considered.	—Percentage of Moisture.— 4	6	7	8.5	10	12
Apparent specific gravity...	2.11	2.17	2.19	2.16	2.10	2.06
Compression at 1,350 deg., Cent., depth of impres., in	0.49	0.44	0.43	0.51	0.53	0.57
Expan. per ft. of length at 1,350 deg. Cent., in.....	0.064	0.064	0.045	0.045	0.049	0.050
Impact at 260 deg. Cent., height of drop, in.....	18.00	33.00	35.00	35.00	31.00	30.00
Abrasion at 1,350 dg. Cent., in five minutes, in.....	0.024	0.008	0.012	0.016	0.028	0.020
Slag penetration, sq. in.:						
Blast furnace slag.....	0.37	0.30	0.24	0.28	0.43	0.36
Open-hearth slag	0.82	0.48	0.58	0.66	0.66	0.74
Heating furnace slag...	1.05	0.35	0.29	0.42	0.42	1.26

Table II

TESTS ON A HIGH-PRESSURE, LOW-MOISTURE BRICK AND A HAND-MADE, REPRESSED, ORDINARY-MOISTURE BRICK

Properties considered.	Kind of brick. Pressure of 1,500 lb. per sq. in., moisture, 7 per cent.	Hand made, repressed, ordinary moisture.
Compression at 1,350 deg. Cent., depth of impression, in	0.29	0.55
Expansion per foot of length at 1,350 deg. Cent., in	0.062	0.059
Impact at 260 deg. Cent., height of drop, in	45.000	28.000
Abrasion at 1,350 deg. Cent. in five minutes, in	0.02	0.04
Spalling, loss, per cent.....	9.4	10.6
Slag penetration, sq. in.:		
Blast furnace slag	0.27	0.56
Heating furnace slag	0.26	0.67

placed so that their enclosed angles face each other and are braced 3⅜ inches apart measured from the inside of the angles, so as to allow a ball 2½ inches in diameter to fall freely between them, the sidewise movement of the ball not to exceed ¼ inch. These angle irons are adjusted so that bricks of different heights may be placed under them and are marked, beginning at the lower ends, so as to clearly designate successive heights of 2 inches. The test specimen is placed directly below the angle irons on a steel block of sufficient size to give a solid foundation. The upper face of the block is perfectly smooth and at right angles to the angle irons. The block is 6½ x 15 x 12 inches and weighs 332 pounds. The falling weight is a steel ball 2½ inches in diameter weighing 2.34 pounds.

The brick to be tested is first carefully inspected, and, if necessary, ground on a carborundum wheel so that it sets firmly on one of its ends. On the other end of the brick the diagonals are then drawn to locate the center. The brick is now placed in a cold furnace and heated at a uniform rate from atmospheric temperature to 260 degrees Cent., so that at least one hour is required to reach the final temperature. The final temperature is maintained for not less than three hours.

The brick is now ready for the test and is placed on the steel block, so that the ball between the angle irons touches the brick at its marked center. Iron blocks are placed around the brick until they are nearly level with the top of it, to prevent sidewise movement, but the brick is not wedged. The ball is now dropped from a pair of tongs on the end of the brick at successively increasing heights of 2 inches until the brick fractures. Any fracture radiating 1 inch or more from the point of contact of the ball is considered a fracture, and the distance in inches of the last drop is the result of the test. If the ball is allowed to drop again from the last height the brick gives off a dead or broken sound. The clear ring of a sound brick has disappeared.

Making a Compression Test

The machine for determining the resistance to compression is a modified Brinell ball testing machine and consists of a 4-inch I-beam, 10 feet long and weighing 75 pounds, so arranged as to act as a second-class lever arm; that is, one end is the fulcrum and at the other end the weight is applied so as to produce the compression on the brick placed 6 inches from the fulcrum. All bearings are knife-edged. The fulcrum end of the bar is mounted between two vertical uprights, 10-inch channel irons, and so arranged that the height of the fulcrum may be adjusted by a hand wheel to suit bricks of varying thickness. Six inches from the fulcrum towards the weighted end of the bar a spherical depression marks the location of the ball. The ball is a steel ball 2½ inches in diameter weighing 2.34 pounds. The brick to be tested rests on a solid foundation directly below the depression. The bar alone produces a pressure of 850 pounds on the ball, and the balance of the weight is added at a uniform rate of 25 pounds per second by means of dry sand which flows from a hopper into a bucket attached to the end of the bar. Bar and sand together produce a total load on the ball of 1,600 pounds.

The brick to be tested is placed in a cold furnace and heated slowly to 1,350 degrees Cent. The heating as a

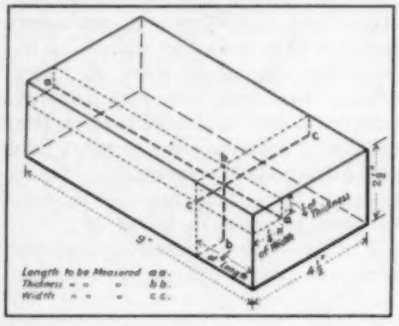


FIG. 16—AXIS ALONG WHICH MEASUREMENTS ARE TAKEN IN DETERMINING THE SIZE OF A BRICK

convenience is done over night, at a uniform rate not to exceed 260 degrees Cent. per hour. Total time of heating should in no case be less than six hours. The brick before testing should be maintained at 1,350 degrees Cent. for not less than three hours.

The brick is now removed from the furnace and placed flat on the foundation beneath the bar, and the bar lowered so that when the ball is in position in the depression, it is also in contact with the center of the upper surface of the brick. The weighted end of the bar is then gently released and the flow of sand immediately started. The time required to remove the brick from the furnace and apply the load is less than one minute. The pressure is maintained for five minutes, starting from the time the bar is released. The brick is then removed from the machine and allowed to cool. When cold the depth of penetration produced by the ball is measured by placing centrally over the depression a flat rectangular plate 3½ inches square and ¼ inch thick, at the center of which is mounted at right angles to it a micrometer depth gage. The lower end of the stem of the micrometer is rounded so that it has the same radius as the 2½-inch ball. The depth at the center of the depression is measured to 0.001-inch.

Making an Abrasion Test

The abrasion testing machine consists of a carborundum wheel mounted on a suitable stand and revolving vertically. In front of the wheel and resting on the stand is an L-shaped plate 6½ x 16 x ¼-inch resting on roller bearings, and forced towards the wheel by means of a right-angle lever arm, and suspended weights. The upper surface of this plate is 1¼ inch below the horizontal radial line drawn from the center of wheel. All points of contact on the lever arm are knife-edged and friction is reduced to a minimum. The carborundum wheel is 18 inches in diameter, has a 2-inch face and 1½-inch center hole. The wheel is motor driven and has a surface speed of 1,640 feet per minute and is to be redressed when the corners wear away ¼ inch of their original radius, or as soon as the face ceases to be at right angles to the side of the wheel. The pressure of the brick against the wheel is 10 pounds per square inch of brick in contact with the wheel, excluding the pressure required to move the brick.

The brick before testing is ground cold to a uniform thickness of 2.35 inches for 2½-inch brick and of 2.80 inches for 3-inch brick, and the ends ground so that the testing wheel cuts through this thickness. The depth of this preliminary cut is measured at its center, using the rectangular plate described under the compression test. The brick prepared for test is heated the same as under the compression test, except in the case of topwall and pipe brick, which are heated the same as for the impact test.

The brick is then removed from the furnace, placed flat on the plate in front of the wheel so that the wheel enters the preliminary cut, and is then abraded for five minutes. The time is taken with a stop-watch. In the case of soft brick which abrade very rapidly the test is run for a fraction of the period, and then calculated to the five-minute period. The brick is now returned to the furnace and reheated for not less than one hour. The test is then repeated on the other end of the brick. When cold the depth of cut on both ends is measured, and the difference between the preliminary and the final cuts is

the result which is reported. Preparatory to the spalling test, the furnace is heated to 1,350 degrees Cent. and held at this temperature for about one hour. The bricks to be tested are dried at 100 degrees Cent. for at least five hours, weighed, and then placed in the doorway of the furnace, their ends flush with the inside of the wall. In case a sufficient number of bricks are not being tested to entirely fill the doorway, the remainder of the space is filled in with other bricks to insure heating the ends only. The bricks are now heated for one hour and plunged separately into two gallons of water at 20 degrees Cent. to a depth of four inches and held there for three minutes. The bricks are then removed and allowed to dry for three minutes in air. To indicate three-minute periods a stop-watch is used. The bricks are then placed in the door-way of the furnace as before and operation repeated for a total number of 10 times. The bricks are now dried at 100 degrees Cent. for at least five hours and all particles, which can be easily broken off with the fingers, removed. The bricks are then weighed and the percentage of loss calculated from the original weight.

Making a Slagging Test

In preparing the sample for the slagging test, the 9 x 4½-inch unbranded side of the brick is bisected by a line across the narrow dimension and diagonals drawn on each half. At each intersection of the diagonals a circular cavity is drilled 2½ inches in diameter and ½ inch deep at the sides. The drills are 5/16 inch thick and 2½ inches wide, measured diagonally across opposite corners, while the point of the drill includes an angle of 150 degrees. A template is made of 3/16 inch sheet steel to insure that all drills are ground properly. To insure a standard depth of cavity, two inverted U-shaped pieces of metal are clamped to each drill when in use and adjusted so that drill cannot enter the hole more than ½ inch, measured on the side of the drill. The cross-section of the cavity passing through the deepest point has an area of 1.7 square inch, and is checked up for size and depth by a template. The pressure used in drilling must not be so severe as to partially crack the brick.

After the cavities have been drilled and cleaned of loose material the bricks are placed level in a cold furnace and heated as in the compression test. When 1,350 degrees Cent. is reached 35 grams of standard blast-furnace slag are placed, by means of a long rod with a spoon-shaped end, in one cavity, and 35 grams of standard heating-furnace slag in the other cavity. The slags used shall have approximately the following analysis and melting points:

	Slag.	
	Blast furnace, per cent.	Heating furnace, per cent.
Silica (SiO_2)	38.0	35.0
Iron (Fe)	1.5	44.0
Manganese (Mn)	1.0	0.5
Alumina (Al_2O_3)	14.5	6.0
Lime (CaO)	42.0	1.5
Magnesia (MgO)	2.0	0.5
Sulphur (S)	1.0	....
	Deg. Cent.	
Melting point	1260	1260

The fineness of the slag is such as to pass a 40-mesh sieve. The bricks are kept at a temperature of 1,350 degrees Cent. for two hours after the slag is added, at the end of which time the furnace is allowed to cool, or the bricks may be removed from the furnace and allowed to cool in air. The bricks when cold are sawed lengthwise at a right angle to the unbranded side, so that one side of the cutting wheel cuts through the center of the drilled cavity, and this area of slag penetration, together with the cavity is measured with a planimeter. The area of the original cavity is subtracted, giving the result in square inches of slag penetration. The wheel used for sawing the brick is a carborundum wheel 12 inches in diameter, ⅛-inch thick and 1½-inches center hole.

The test specimens for determining the softening temperature are cut by means of the saw used in slagging test from the corner of the brick, in the shape of a triangular pyramid similar to that of a Seger cone. They are three inches high, and the base should not be less than one inch on the side. The test specimen, together with a series of Seger cones, is set in some good refractory material which will not flux with the sample. The series of cones used includes numbers both below and above the cone at which the sample is supposed to soften. The whole is placed in a gas-fired furnace and heated at a uniform rate, not to exceed 600 degrees Cent. per hour. The softening temperature is considered that at which the specimen either bends double, sags, or puffs out of shape and is determined by Seger cones.

Testing for Expansion and Contraction

The machine used for the measurement of expansion and contraction consists of a micrometer mounted on a steel post, which in turn is mounted on a steel plate 24 x 6 x ½ inch. To the stem of the micrometer is fastened a steel disc 1 inch in diameter and ⅛-inch thick. In line with the micrometer is a second steel post on which is mounted a ¼-inch sliding steel rod with a similar circular disc, as with the micrometer. The rod can be adjusted so as to determine measurements up to 14 inches. To insure that this rod is properly set standard bars 3, 5, 9, 11 and 13 inches long are used.

In preparing the brick for the test, the ends of the brick are ground so as to be parallel to each other at right angles to the sides. The length is then measured cold. The brick is then heated as in the compression test,—or as for the impact test in the case of top-wall and pile brick,—removed from the surface and measured hot. The removal from the furnace and measurement usually requires about 30 seconds. The result is calculated to inches per linear foot.

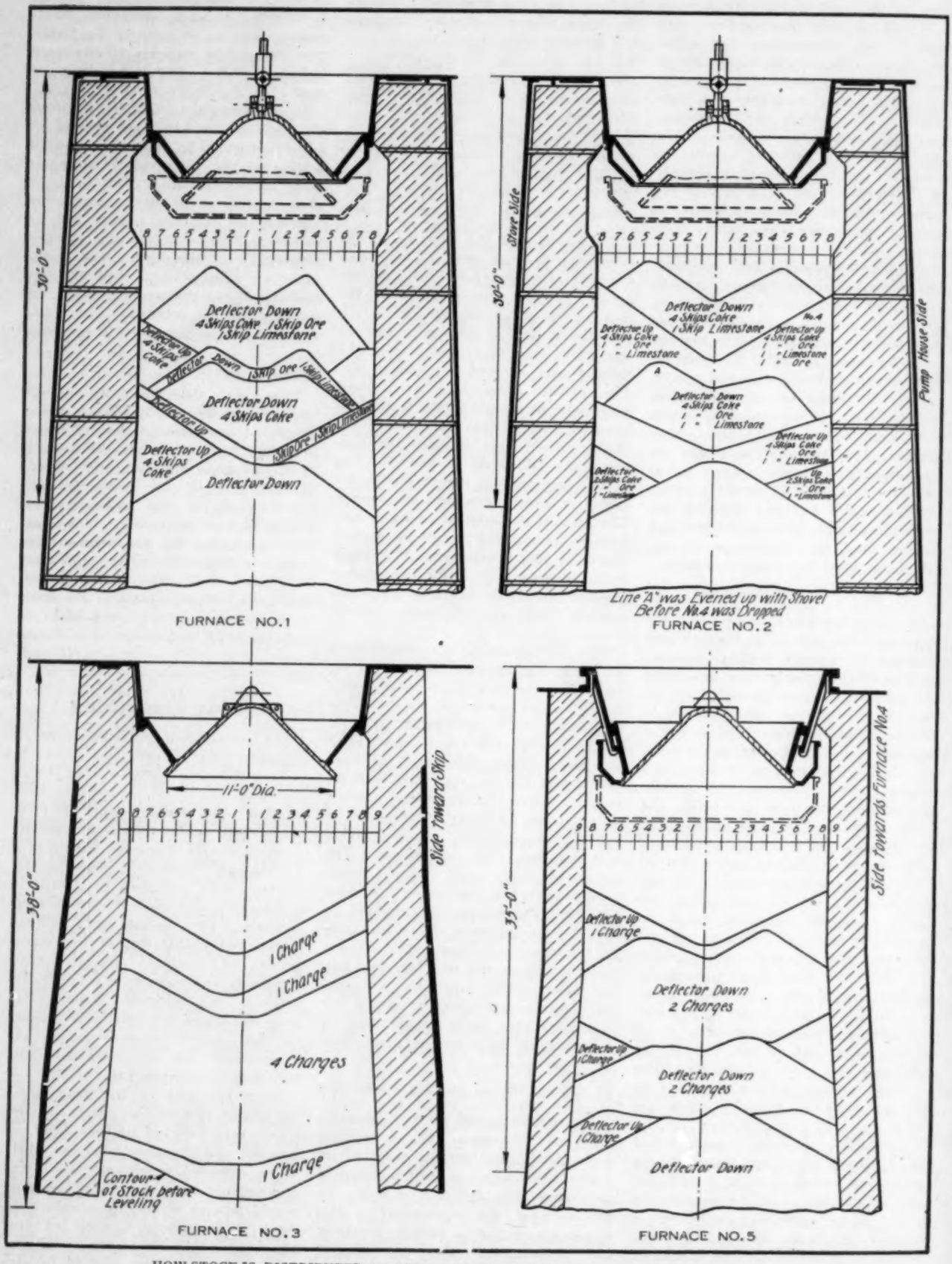
Test For Size

The size is determined by the use of the micrometer described under expansion and contraction. All measurements are made while the brick is at atmospheric temperature. Small particles of sand, clay, or foreign matter adhering to the brick are removed before measuring. The locations for taking the measurements are shown in Fig. 16. If the bricks are of a different size than a standard 9-inch brick the measurements are made in the same way but at a point of one-fourth of their respective dimensions.

Alloy From Slag

The reclamation of ferro-alloys of manganese and silicon from bessemer and open-hearth furnace slag by a profitable process is reported to have resulted from research work at present carried on by two undergraduate students of the Carnegie Institute of Technology, Pittsburgh. The slag has hitherto been relegated to dumps in many cases, and used in various ways —crushed, as ballast for railroad tracks and granulated, in the manufacture of Portland cement. Now comes its entrance as a valuable by-product. An electric furnace has been developed whereby it is claimed the high priced ferro-manganese and ferro-silicon can be extracted from the slag at a reasonable cost.

After the first of the year, when the stocks of ferro-manganese in Germany were believed to have been exhausted and no more ore was likely to be imported, much speculation was encountered as to the course Germany would take in employing a substitute. Now it is generally conceded that the huge slag piles in the vicinity of Westphalia are being worked to give up their manganese.



HOW STOCK IS DISTRIBUTED AT OHIO WORKS FURNACES OF CARNEGIE STEEL CO.

Handling the Blast Furnace Charge

THE McDONALD distributor has been successfully employed at the Youngstown blast furnaces of the Carnegie Steel Co. for some years. The author, in the accompanying article, describes the method of charging, the rotation of the skip loads and presents a table showing the results that have been obtained

BY J. C. BARRETT

PROPER distribution of blast furnace stock is of great importance and has much to do with economical furnace operation. Many phases of furnace practice have an allied relation to distribution, such as the lines of the furnace, the relative size of the big bell and stock line, the quality of coke—its size and the amount of breeze, the condition of lining, the method of charging and the fineness of the ores. A furnace in which these conditions are satisfactorily adjusted, with the stock uniformly distributed on the big bell is well prepared to operate.

In handling ores the fine and coarse tend to segregate. As the ore is successively drawn from the bins to the scale car, and thence to the skip and receiving hopper, the coarse ore has a tendency to take a position different from the fine. The revolving hopper was developed to overcome this irregularity. The stock deposited in the furnace from the big bell takes a fixed position like an inverted cone. The fine material is next to the wall and usually is quite compact, the large pieces are in the center of the furnace where there is a depression. The larger portion of the coke is in the center and offers the least resistance to the passage of the gas. This condition would naturally produce a rich gas. To get some work from this rich gas, stock should be directed into this flume of open stock.

The McDonald distributor serves to deflect the stock towards the center of the furnace at will. This distributor is movable and when not in use hangs behind the hopper extension. The accompanying illustration shows how the stock is distributed in four of the Carnegie Steel Co.'s furnaces at Youngstown, O.

From Mr. Vreeland's paper I quote as follows:

"The large charge of 14,000 to 16,000 pounds of coke and 30,000 to 35,000 pounds of ore with the necessary amount of stone forms thick heavy layers of each material, and although the coke does not offer much resistance to the gas, the heavy layers of ore, especially that part thrown towards the center of the furnace, prevent the free ascent of the gases. The gases in their ascent follow the path of least resistance and cause imperfect and incomplete reduction of the ores in the denser part of the charge. This condition can be overcome only by direct carbon reduction in the lower part of the furnace.

"To remedy this the charge is often split in two, thereby cutting the layers in half which gives us a ring of ore of maximum thickness near the walls, tapering off gradually towards the center, where the lumps have a tendency to roll. This method has been demonstrated to be an improvement over the large charge, but a condition may arise wherein we have too much ore close to the walls and too much coke towards the center. This would cause the center to travel too fast with respect to the materials close to the walls and result in greater loss in flue dust."

These conditions are remedied by the distributor used at the Ohio Works, Carnegie Steel Co., Youngstown, O. Our method has always been to use a large ore charge, 28,000 to 32,000 pounds. The coke, ore and stone are deposited on the big bell in the following sequence: Two skips of coke, one skip of ore, two skips of coke, one skip of ore and one skip of stone, seven in all. They are lowered into the furnace as a mixed charge. The repose of the ore and coke in the furnace is quite different. The ore has a higher angle than the coke. The center of the furnace no doubt travels faster if for no other reason than its freedom from the friction of the walls. This comparatively rapid travel draws the stock towards the center. In use two charges of stock are discharged against the furnace wall with the distributor up, and then one charge is deflected towards the center, after the distributor has been dropped down. Our experience has been that coke breeze and limestone dust are detrimental to furnace operations. When the distributor is down we are enabled to throw two of the limestone skips to the center making the charge two skips of stone, three of coke and two of ore. In the two charges going to the side, one charge consists of one stone, four of coke, two of ore and the other of no stone, five of coke, two of ore. This sequence thins out the fines on the side of the furnace, and allows freer passage to the gas.

Another beneficial effect is when the furnace is clogged up and gives the appearance of being built up on the bosh. By charging the furnace with the distributor up for one charge and then down for one charge, it is possible to put in the center, the charge made up of two skips of stone, three of coke and two of ore and to the side of the furnace a charge made up of no stone, five of coke and two of ore. By charging in this manner for a certain period, all of the stone is put in the center and extra coke at the side. This allows more freedom to the gas at the sides and gives an opportunity to clean up the furnace.

Five of our six furnaces are equipped with McDonald distributors. The operation of all furnaces since last blowing in or since the last repair, until April 1, 1916, is shown in the following table, No. 3 furnace being the one not equipped with a distributor:

Furnace	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Blown in	3/9/15	7/22/14	2/18/14	2/1/15	1/25/15	2/1/14
	4/1/16	4/1 /16	1/14/16	4/1/16	4/1 /16	4/1/16
Length of service.	1 yr. 22 da.	1 yr. 7 mo. 9 da.	1 yr. 10 mo. 26 da.	1 yr. 2 mo.	1 yr. 2 mo. 6 da.	2 yr. 2 mo.
Coke, pounds per ton of pig iron.	1,907	1,982	2,236	2,198	2,104	2,143
Average tons pig iron per day....	570	544	485	523	529	497

No. 3 blown out to repair stock line 1/14/16.
No. 5 from date of repairing stock line.
This table includes coke dust which averages about 50 pounds per ton of iron and does not go into the furnace.

The distributor has served a useful purpose by distributing the stock economically. It is used on normal or standard sized bells and is adapted to all kinds of filling. Two features must not be overlooked, one being the use of water on the stock by which it is possible to keep the gas

A discussion of the paper presented by George W. Vreeland at the New York meeting of the American Iron and Steel Institute, which has appeared in preceding issues of *The Iron Trade Review*. The author, J. C. Barrett, is superintendent of blast furnaces, Carnegie Steel Co., Youngstown, O.

temperature about 300 degrees Fahr. In any method of filling, if the water is omitted it will allow the temperature to go high and vitiate any uniform distribution by allowing the excess dust to blow over. The other feature is a perect condition of the stock line which if lost upsets all other important distribution economies. With a uniform distribution of the stock when it is placed in the big bell, proper deflection of the stock in the furnace, low temperature of the top gases and a good stock line, it was possible from Jan. 1, 1909, to Jan. 1, 1916, to make an actual tonnage of iron with the use of raw flue dust (881,670 tons raw dust used and 529,779 tons of dust produced) of 6,008,556 tons, whereas the available tonnage of iron without the use of dust was 5,959,231, a gain of 49,325 tons, a long step toward conservation of material and labor.

Graphite Molds for Metals and Alloys

CHARLES VICKERS, Niagara Falls, N. Y., well-known expert in brass foundry practice, has been granted a patent on a permanent mold made of graphite for making non-ferrous metal castings, which he has assigned to the Titanium Alloy Mfg. Co., of Niagara Falls, N. Y., with which he is affiliated. The mold is made of graphitized carbon used preferably in the form known as artificial graphite. This is exceedingly refractory and is resistant to high temperatures and, therefore, the mold can be used repeatedly for making castings. This substance is one of the most rapid heat conductors known and consequently has a rapid chilling effect on the metal, preventing liquation attributable to slow cooling of the metal in the mold.

Liquation of Constituents

It is well-known that in the production of castings from alloy comprising two metals, the one of which is of a high and the other of a relatively low melting point, a separation throughout the casting into alloys of different composition takes place. Such alloys having the highest fusing point solidify first and the entire mass becomes only gradually solid by further cooling. Therefore, when freezing or solidification commences, an alloy rich in the metal of the higher melting point and poor in the metal of the lower melting point will first separate as a solid and this is followed by the solidification of various other alloys containing progressively less of the former metal and more of the latter, the last alloy to separate and to solidify being proportionately very rich in the metal of the lower melting point and correspondingly poor in the other. The resulting casting thus lacks homogeniety and consequently is weaker in spots than it should be. The graphite mold overcomes this liquation and causes the rapid cooling of the metal.

It also is pointed out that graphitized carbon is capable of having its heat-conductive property modified and adjusted to meet the requirements of different metals or even different parts of the same casting. For example, when meeting special requirements, Mr. Vickers has constructed these permanent molds from graphite, either artificial or natural, with a binder such as tar or pitch, which then was baked in a furnace similar to the procedure in ordinary carbon manufacture. When a heat conductivity was imparted to the mold too great for successful use in certain forms of castings by this process, he adjusted the heat conductivity to that required by adding to the constituent mixture a certain amount of amorphous carbon, determined to be sufficient to reduce the heat conductivity of the mold. He also states that he can form his permanent molds wholly out of the amorphous carbon and then graphitize them in an electric furnace. Here again he is able to adjust their heat conductivity as required. By correspondingly adjusting the temperature of the furnace, he is able to regulate the extent of the graphitization of the amorphous carbon and thereby correspondingly control the heat conductivity of the resulting mold. The heat conducting properties of the permanent mold can be adjusted locally by varying its thickness at different points or zones, corresponding to the thicker and thinner parts of the castings and by this means he insures more rapid heat withdrawal from the thicker parts and less rapid from the thinner parts of the mold, thus insuring substantial uniformity of heat-withdrawal from all parts of the casting at the same rate and an equal amount during a given time.

Temporary Molds

In cases where a permanent mold is not required, a temporary mold can be made from a form of graphite obtained by the decomposition of silicon carbide or other similar carbides, since this form possesses plastic, coherent properties when subjected to pressure. Also, the temporary mold may be made from a mixture of graphitized carbon and molder's sand, regulating the proportions so as to impart to the mold the degree of heat conductivity best suited to the particular kind of casting desired. For the purpose of demonstrating the influence of the graphitized carbon permanent mold on the physical properties of non-ferrous metal castings, Mr. Vickers made a series of tests with an alloy containing aluminum, 92 per cent and copper, 8 per cent. From this alloy he made castings from the same heat in four different molds made respectively of sand, amorphous carbon, iron and graphitized carbon. The results of these tests follow:

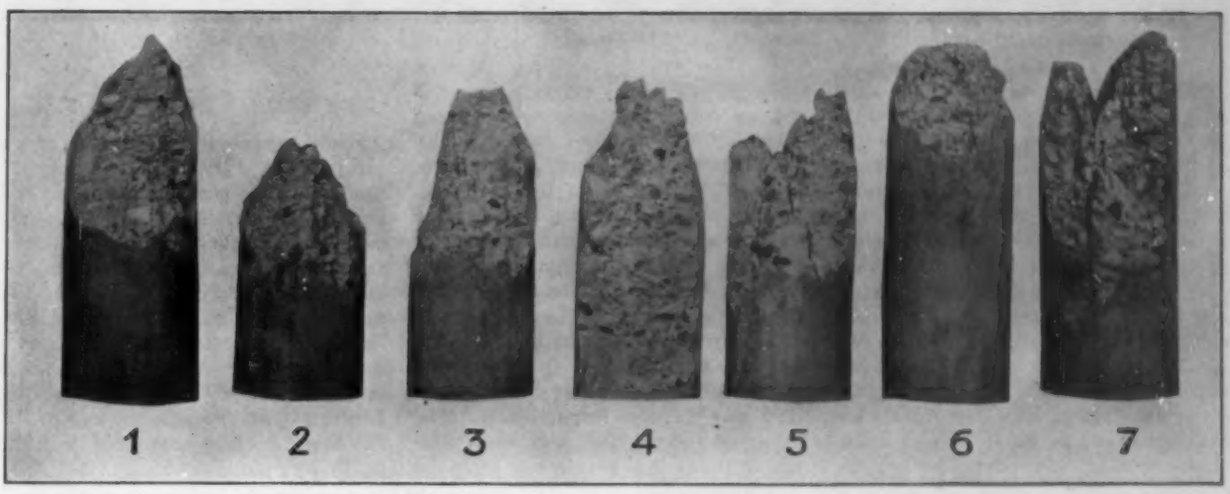
Casting.	Ultimate strength, pounds.	Per cent elongation.	Per cent reduction.
In sand mold.....	12,300	1.0	0.7
In amorphous carbon mold	17,700	1.8	1.3
In iron mold.....	25,500	3.5	4.1
In graphitized carbon mold	26,300	3.8	4.4

The four substances thus employed are superior to each other in heat conductivity as molds in the order named, that of sand being the least and that of graphitized carbon the greatest. Similar tests with other alloys gave analogous results.

Graphite and Sand Molds

Tests also were made on temporary molds consisting of a mixture of sand with graphite as compared with that of sand molds, the alloy used having consisted of 92 per cent aluminum and 8 per cent copper. The ultimate strength of the castings made in the sand mold was 21,650 pounds and that from the graphite and sand molds 26,780 pounds.

In view of the rapid chilling properties of the graphitized carbon mold, it is necessary to employ risers or feeders of ample size made of a lower heat conducting substance or mixture than the mold itself. The riser is made of molder's sand and by its use the casting is continuously fed until solidification takes place. In casting in sand molds, for example, for some alloys it has been found necessary to have the riser fully as bulky as the casting and in making some alloys, such as aluminum bronze, the ratio of bulk of riser to that of the casting has been as high as 1½ to 1.



Seven 6-inch Cylinders Crushed During Test

Tests of Reinforced Concrete Pipe

A DISCUSSION of a series of experiments on reinforced concrete cylinders and pipe—These tests were made to determine the maximum pressure which could be sustained by concrete pipe at various ages as well as to verify certain claims that concrete would meet railroad specifications for culvert service pipe

BY JOSEPH S. LAMBIE

A NUMBER of tests of reinforced concrete pipe were made recently in the materials testing laboratory of the University of Pittsburgh, Pittsburgh, for the purpose of determining the deformation under working loads at 30 days; the ultimate strength and character of failure at 90 days, and the effect of age on strength between 30 days and 90 days. Four sections, each of 30-inch and 36-inch pipe, were tested. The pipe, manufactured by the Concrete Products Co., Pittsburgh, was in standard lengths of 4 and 6 feet, with full bell and spigot, but for convenience in testing and accuracy in applying the loads, the bell was omitted in the test specimens and the lengths cut to 31 inches and 37 inches, respectively. The 30-inch pipe had shells 3 inches thick and were reinforced with two continuous spirals of ¼-inch wire on 4-inch pitch. The 36-inch pipe had shells 3½ inches thick and was reinforced with two continuous spirals of ¼-inch wire on 3½-inch pitch.

The pipe was tested in a 200,000-pound Olsen machine, with the load applied along a line at the crown, and the pipe supported along a line at the invert. No lateral supports, saddles or cradles were used, and no attempt was made to obtain a uniformly distributed load as such factors, by introducing arch action in themselves, will produce confused and unreliable results on the strength of pipe. The existence of such arch action, under conditions of service, immeasurably increases the strength over that given by these severe conditions of test. Deformation of both horizontal and vertical diameters was obtained by special apparatus constructed for the purpose of measuring accurately to 0.0002 inch.

The object of the 30-day tests was to determine the rigidity of the pipe under ordinary loads. During these tests a maximum loading of 5,000 pounds on the 30-inch pipe and of 7,000 pounds on the 36-inch pipe was used. The loads were applied in increments of 500 pounds, and deformation noted after each addition. The deformation of the vertical diameter was generally a little greater than that of the horizontal, but both were so slight as to be negligible. The combined average deformation for 30-inch pipe under 2,500-pound loads was only 0.0080-inch and under 4,000 pounds was 0.0279 inch. The 36-inch pipe under 4,000-pound load deflected 0.0071 inch and under 7,000 pounds deflected 0.0220 inch. About one-quarter of the deformation in each case was retained as permanent set on removal of the load.

The object of the 90-day tests was to repeat the previous ones and not

Deformation and Strength of Concrete Pipe

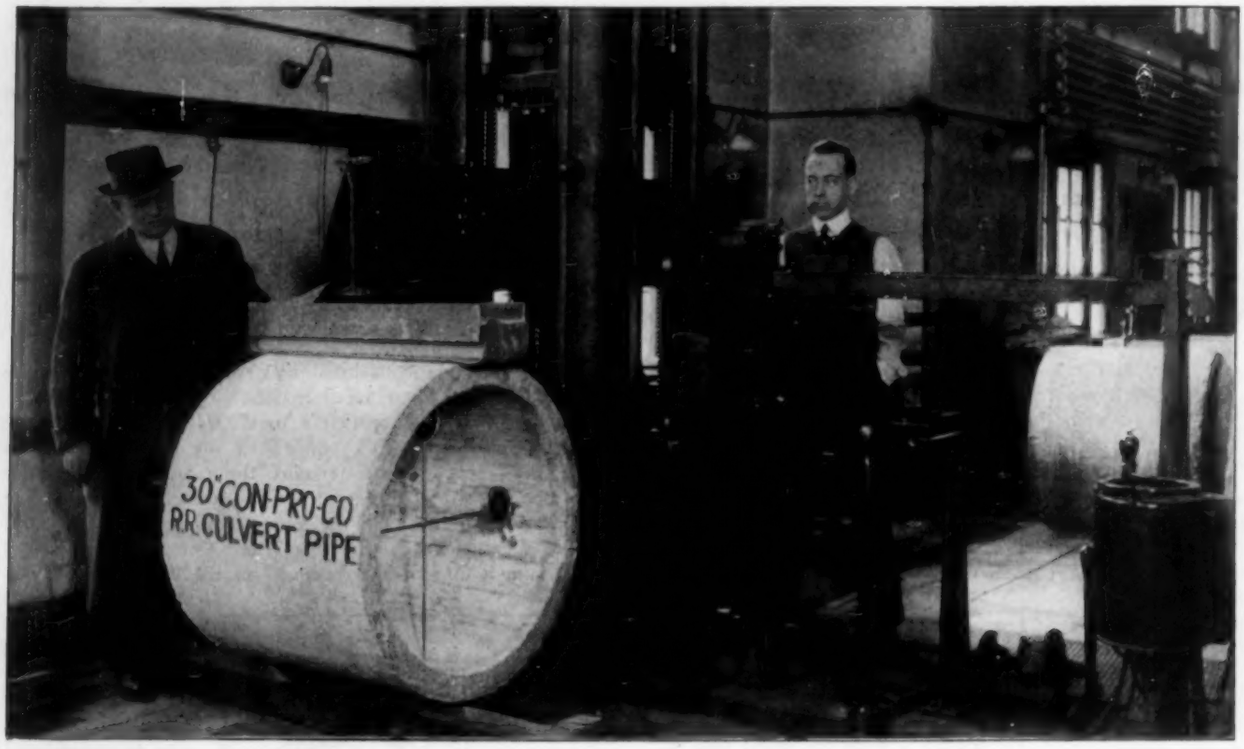
	30-day test		90-day test				
	30-inch Pipe						
Pipe number.	Under load of, pounds						Maximum load, lbs.
	3,000	4,000	3,000	4,000	6,000	8,000	
1	0.0087	0.0177	0.0088	0.0317	0.1433	0.2308	16,000
2	0.0136	0.0639	0.0104	0.0880	0.1397	0.2300	19,200
3	0.0095	0.0169	0.0103	0.0121	0.1080	0.2190	16,200
4	0.0081	0.0133	0.0094	0.0131	0.1090	0.2040	21,000
Average	0.0100	0.0279	0.0097	0.0362	0.1250	0.2209	18,100

	36-inch Pipe						
Pipe number.	Under load of, pounds						Maximum load, lbs.
	4,000	6,000	4,000	6,000	8,000	10,000	
5	0.0059	0.0107	0.0065	0.0102	0.0179	0.0647	16,300
6	0.0075	.....	0.0068	0.0135	0.0305	0.0815	17,200
7	0.0073	0.0109	0.0072	0.0122	0.0423	0.1403	16,700
8	0.0075	0.0124	0.0075	0.0129	0.0846	0.1411	17,000
Average	0.0071	0.0113	0.0070	0.0122	0.0438	0.1069	16,800

The author of this paper, Joseph S. Lambie, is assistant professor of civil engineering, University of Pittsburgh.

the effects of aging, and also to increase the load to the ultimate capacity of the pipe. The methods of loading and obtaining the deformation were the same as in the earlier tests, but the pipe was turned through an angle of 45 degrees from the position of the first test. The sections of contraflexure in the first tests thus became sections of maximum moment in the final tests. Very little difference in deformation for small loads was noted over that previously recorded. A comparison of the two with a record of the deformation under greater loads is given in the accompanying table. The maximum load reached in each case is also shown. Since the delicacy of the deformeters made it undesirable to leave them in place as the pipe failed, no record of the ultimate deformation was obtained. In every case failure occurred through the deformation and opening up of longitudinal cracks at the crown and invert. Cracks subsequently developed on the outside of the shell at the haunches, due to the steel reinforcment having reached its elastic limit.

In the cylinder tests, cylinders of plain concrete, 6 inches in diameter and 18 inches long, made at the same time and of the same material and mix as the pipe sections, were tested at the same age for compressive strength and modulus of elasticity. One cylinder tested to destruction at 30 days, developed a compressive strength of 3,325 pounds per square inch. The average modulus of elasticity of all eight cylinders at this age, as determined by loads running up to 30,000 pounds on each cylinder, was 3,500,000 pounds per square inch. On the 90-day tests of the seven remaining cylinders, the remarkable modulus of 6,200,000 pounds per square inch was obtained for similar loads. In this connection, it should be noted that there was no noticeable set resulting from the first tests. The average ultimate load in the final tests was 93,100 pounds per cylinder or 3,290 pounds per square inch. The failure in every case was very sudden and was due principally to shear in the majority of the tests made. The exceptionally good results obtained in this series of tests are probably due to the use of well graded gravel aggregate, mixed in proportions that volumetric tests indicate as giving the greatest density, and also to the use of a jarring machine to thoroughly compact the concrete in the forms. Investigations by the American Society for Testing Materials would seem to indicate that under trench conditions, a load 50 per cent greater than that used in these tests would be needed to produce the same results. Using this ratio, which the writer believes to be extremely moderate, it is evident that the pipe is sufficiently strong to be used in railroad culvert service for which it was designed.



SPECIMEN OF 30-INCH REINFORCED CONCRETE PIPE UNDER TEST

Portland Cement Output

Final figures on the Portland cement industry in 1915, gathered by the United States geological survey, confirm the estimate made on Jan. 1, that there was a slight increase in shipments and a slight decrease in production. The shipments of Portland cement in 1915 were 86,891,681 barrels, valued at $74,756,674 in bulk at the mills; the shipments in 1914 were 86,437,956 barrels, valued at $80,118,475. The finished cement made in 1915 amounted to 85,914,907 barrels, which, compared with the 88,230,170 barrels made in 1914, shows a decrease of more than 2½ per cent. The average factory price per barrel was 86 cents in 1915, compared with 92.7 cents in 1914, a decrease of 6.7 cents, or 7.2 per cent, in average price. According to the survey's statement, prepared by E. F. Burchard, some of the commercial districts made a larger and some a smaller output than in 1914. Slight increases (less than 10 per cent) in output were reported from the Lehigh district and from most of the central districts; decreases were the rule in New York, Indiana, Illinois, and in the Rocky Mountain and Pacific Coast states. Increases of more than 10 per cent were made in the south-eastern states, the largest increase, 20.3 per cent, was made in the Tennessee district.

WHAT'S WHAT and WHY

Don't Ask Yourself-Ask Us!

Questions from our Readers answered by Experts

Price of Spelter

What is the highest price reached by spelter since the European war caused it to soar?

The crest of the rise in spelter was reached during the week of June 7, 1915, when it was quoted nominally at 28 cents, St. Louis base. Spelter normally had been on a basis of 5 to 6 cents for a long time and did not increase greatly until January, 1915, five months after the war started. The rise during the next six months was steady and rapid but after that time it dropped back and in August was quoted as low as 11.5 cents. Since that time it has ranged between 9.87½ and 21 cents, reaching the latter level in February, 1916.

Stands for Enameling Ovens

Will you kindly advise us if there is a suitable metal we can use for making bucks or stands for supporting cast iron enameled ware in the enameling ovens? The ones we are using are made of ordinary cast iron, composed of foundry pig and clean stove scrap. They last but a short time and soon become burned and unfit for remelting.

It is suggested that your stands be made of white cast iron containing less than 1 per cent silicon, which will resist the heat better than ordinary gray iron because it contains practically no graphite.

Future Production of Ferro-Manganese

Will this country after the war continue to produce standard ferro-manganese to the extent to which this line of manufacture has now been stimulated by reduced English imports?

The answer to this question apparently must be found in the availability and price of manganese ore after the war. The United States, for practical purposes, has no home supply of ore for the making of standard ferro-manganese, that is, a mineral assaying over 30 per cent. At present, most of the ore from which standard 80 per cent ferro-manganese is being made in this country, comes from Brazil. We are now receiving the great bulk of the output of that country, importing last year about 350,000 tons, whereas before the war, England received considerable tonnage from that country and Germany a moderate amount. Our present production of ferro-manganese in this country is about 250,000 tons, requiring approximately 500,000 tons of ore annually. We ought to be able to continue to command much of the Brazilian ore after the war, as England, Germany and other European makers will have the extensive deposits of India and the Russian Caucasus to draw upon, the latter the largest potentially of all sources. The danger to our present ferro-manganese industry is that England and Germany with their lower ore and general manufacturing costs, may be able to offer ferro-manganese in this country at a price which would not justify the American user making his own supplies.

Ore Shipments

Will you kindly inform us how many tons of iron ore have been shipped from all the mines in the Lake Superior district? Also, if possible, we would like to learn the tonnage shipped by mines in the state of Minnesota.

The Lake Superior district, excluding Canadian mines, shipped 704,067,625 tons of iron ore up to the close of 1915. Of this tonnage, the Mesabi range shipped 264,321,398 tons; the Vermillion range 37,579,661 tons, and the Cuyuna range 3,181,080 tons. The total Minnesota shipments have thus been 405,082,139 tons.

Ore Differential

When the open-hearth furnace was introduced, it was predicted that within a few years the differential in price between bessemer and non-bessemer ores would soon be eliminated, but with the duplex process gaining favor, does it not now look as though low phosphorus ores were going to be in relatively greater demand? As, however, the supply of low phosphorus ores is exhausted, I presume the furnace people will naturally be obliged to depend more upon the slower converting process.

Opinions among ore people differ as to whether the differential in favor of bessemer ores will be eliminated. The prevailing opinion is that this differential will disappear in time, but it is not likely to be wiped out suddenly.

High Phosphorus Ores

In this year of great activity in the iron and steel trade, is there any particular reason why high phosphorus ores should be a drug on the market?

We confess that we have been somewhat surprised to find that high phosphorus ores have been selling so slowly. In a year in which there is such a tremendous demand for ore, one would think that almost any kind of ore could be sold, but the Lake Superior mines are now showing to a greater extent than ever before their amazing ability to turn out immense tonnages. So much of this ore is fairly low in phosphorus that buyers are still able to turn down the high phosphorus ores.

Prices of Steel Pipe

What changes have been made in prices of steel pipe during the past three years?

The following changes have been made in the price of steel pipe since

Jan. 1, 1913:

April 12, 1913, advance of one-half point on all sizes.

May 27, 1913, advance of one-half point on all sizes.

Aug. 8, 1913, decrease of one point in butt weld; lapweld unchanged.

Oct. 27, 1913, decrease of one point in lapweld; butt weld unchanged.

Feb. 2, 1914, advance of one-half point on all sizes.

April 20, 1914, advance of one-half point on all sizes.

Nov. 2, 1914, decrease of one point (extra preferential discount of 2½ per cent eliminated).

Feb. 11, 1915, advance of one point on black under 6 inches; galvanized advanced from one to three points (abnormal spelter prices).

May 1, 1915, advance of one point on all sizes.

June 1, 1915, galvanized advanced five points (spelter 22 cents a pound).

June 17, 1915, all sizes of galvanized advanced six points (spelter 20 cents a pound).

Aug. 16, 1915, decline of six points on galvanized, ⅛ to 6 inches; larger sizes declined four points (spelter 12 cents).

Nov. 1, 1915, black advanced one point; galvanized unchanged (spelter 14 cents).

Jan. 4, 1916, advance of one point on all sizes (spelter 17.25).

Jan. 20, 1916, standard black, 6 inches and smaller, advanced one point; 7 to 12 inches, advanced three points; galvanized, 6 inches and smaller, advanced two points; galvanized 7 to 12 inches, advanced three points.

Feb. 15, 1916, advance of one point on all sizes, 12 inches and under.

Feb. 29, 1916, black, 12 inches and under, advanced one point; advance of two points on black over 12 inches; galvanized advanced two points (spelter 20½ cents).

March 15, 1916, black pipe advanced one point; galvanized advanced irregularly from two to five points (spelter 16.25).

March 29, 1916, black, 12 inches and under, advanced one point; galvanized advanced two points (spelter was at this time quoted at 17.50).

New Valves for Regenerative Furnaces

BY JAMES A. HERRICK

GAS reversing valves for open-hearth furnaces have sometimes been known to cause trouble and bring about shut downs. Recently a new type of valve has been developed, which is said to possess certain advantageous features. This valve has been designed to minimize the liability of injury due to clogging or excessive heat. It is of the sealed, rotary, water-cooled type. The cylindrical part of the valve, which is immersed in water, is shown in Fig. 1. As indicated in this illustration, the action of the valve depends upon a partial rotation of the cylinder in the water, the level of which is slightly above the axis. Since the sides of the cylinder are alternately immersed in water, which also flows over the top at each reversal, the working part of the valve is kept cool and free from soot or dirt. Scrapers are provided to remove any deposit from the cylinder. The cylinder is lined with fire-proof refractories.

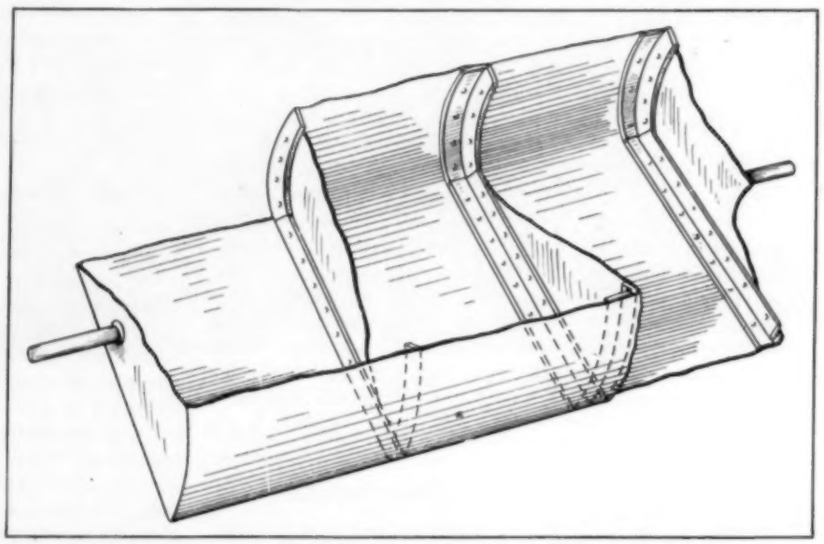


FIG. 1—GAS CONDENSING CYLINDER OF HERRICK VALVE

The hood, which is also brick lined, may be lifted from its position over the cylinder by unbolting the two sections of the neck between the gas box and the valve, thus giving access to the cylinder for repair or inspection without disturbing the mushroom valve or the gas box. Doors on the ends of the hood provide for casual inspection. The bottom of the valve may be of metal, or of brick and concrete construction. The accumulation of dirt and soot may be washed out through a special valve in the bottom provided for this purpose. The air valve used with the new gas valve is the standard Herrick type. The sides and ends of the bonnets are formed of metal plates lined with fire brick and water cooled. The interior of the air valve, showing the flappers and adjustable striking pieces, is illustrated in Fig. 2. The top of the sheet iron box over the air valve is connected to a supply of air under light pressure, with a cut-off damper to correct any variation in the draft from the stack and to avoid an excessive rush of air into the ports. The air valve is operated by water pressure with ordinary control devices. This method may be used to actuate the gas valve where a number of furnaces are operated together and where central control is desirable.

The air and gas connections shown in Fig. 2 have plain checker systems. This system is adaptable to basic furnaces where the slag pockets are in front of and empty into the checker chambers. The walls between gas and air flues are provided with open spaces arranged to make easy the detection of gas leakage. The air exit flues are filled with a special system of checkers which furnish additional regeneration. As a precaution against the gas valve leaking gas to the stack, making repairs necessary, a second gas tube is led from the gas regulating valve, branching just inside the open chamber below the hearth. It is equipped with a cut off to each gas regenerator below the checker work, so that the gas may be directed to either regenerator independently of the regular gas valve or its flues, and reversed as desired. The waste gases may be sent through the air system alone when repairs are necessary.

The author, James A. Herrick, is a metallurgical engineer, 271 Broadway, New York.

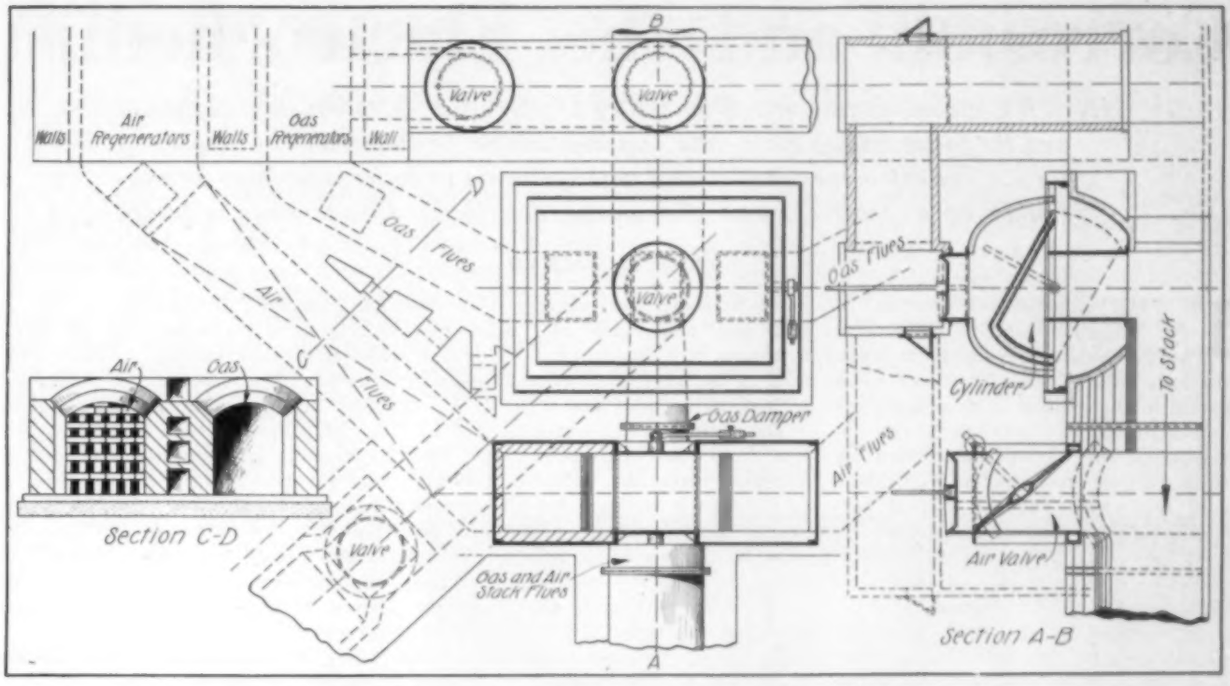


Fig. 2—Arrangement and Detail of Herrick Gas and Air Valve

Install Electric Drive in Hess Mill

BY HENRY L. JAMES

THE Hess Steel Corporation, Baltimore, Md., an outgrowth of the Hess Steel Co., Bridgetown, N. J., is erecting a furnace and rolling mill plant on its 12-acre tract of land near the eastern boundary line of Baltimore. The furnace building, which will house two 6-ton heroult electric furnaces, is of brick and galvanized iron construction. One of the furnaces has already been put in operation and the second will be ready for use in July.

A 150 x 190-foot mill building provides for a 20-inch and a 9-inch mill, each of which is now partially assembled. The rolling mill equipment was furnished by the Philadelphia Roll & Machine Co., and consists of a steel stand 20-inch mill and a five stand 9-inch mill, both of which are electrically driven The electrical apparatus, consisting of a 600-horsepower motor for the 20-inch mill and a 400-horsepower motor for the 9-inch mill, is being installed by the Westinghouse Electric & Mfg. Co. Each of the motors is wound for 25-cycle, 440-volt, 3-phase current and is of the two-bearing pedestal type, arranged with extra heavy bedplates, along which the complete stators may be moved, thereby facilitating repairs. The insulation of these machines is such that a plugging stop and a reversal can be accomplished without danger of breakdown.

For the control of each motor there is provided a primary panel containing the necessary indicating and recording instruments, and primary oil switches for forward and reverse operation. These switches are mechanically interlocked against simultaneous closing. The starting and switch regulation is accomplished by means of Westinghouse liquid type regulators, which can be adjusted to various rolling conditions, so that no excessive overloads or peaks come back into the generating and distributing systems.

Single Reduction Gear

The motor for the 20-inch mill is connected to the mill by means of a single reduction gear drive, the gears having herringbone cut teeth totally encased and running in oil. Cast steel fly wheels of the disc type mounted on the motor shaft extension of this drive take care of all abnormal peak loads.

The motor for driving the 9-inch mill is connected to the mill proper by means of a two-speed special gear drive, each consisting of two sets of cut herring bone gears and pinions of different ratios. The gears are keyed fast on the main driving shafts, while the pinions run loose on the motor shaft. The motor shaft also has keyed to it a sliding crab clutch, which can be thrown in either direction, thus engaging either of the pinions and acting as a single driving member. With this arrangement it is possible with a single motor to obtain either 60 revolutions per minute or 140 revolutions per minute on the mill as desired.

Both mills are of the fixed middle line type and are provided with bottom screw adjustment, which operates by means of a wrench through the gearing below the housings. The adjustment of the top bearing on the middle roll is made by means of wedges which engage against lugs extended within the housing window. A special feature of the mill is that wedges have also been provided between the top and the bottom bearings to prevent pressure and friction on the neck of this middle roll. Another special feature is that the top roll is counterbalanced, steelyard rods having been provided within the body of the housings. The roll carriers also extending into a body of the housings in such a manner as to be carried by steelyard rods.

As a precaution for safety, both mills have been provided with throw-out crab clutches, which have been designed for use with magnets on the same electric circuit as the mill motor.

Emergency push buttoms have also been provided at each stand for quick motor stoppage, and it is later intended to connect the magnets to the same push buttons so that when an emergency button is pressed the current is cut off the motor and at the same time the mill is disconnected by the operation of the crab clutch, thereby bringing the mill to an immediate standstill.

Corrosion and the Electrochemist

IN THE accompanying article the theory of corrosion is thoroughly explained and the factors which enter into this electrolytic phenomenon are clearly set forth. The difficulties encountered with corrosion in boiler tubes may be minimized by a process which the author describes. Co-operation is needed

BY W. H. WALKER

IN THE valuable contribution of Dr. McCullom and his co-workers at the bureau of standards upon the corrosion of iron structures when buried in the ground, a terminology is employed which is very useful in discussing the damage occasioned by stray electric currents, as contrasted with that caused by the natural corrosion of the iron unaccelerated by an external electromotive force. But while it is logical to call the first type of corrosion "electrolytic", because induced by the flow of an impressed electric current, it is, however, illogical to describe the latter type a "self-corrosion" because of the unavoidable inference that it is not electrolytic, but is purely chemical in its nature. It may possibly be due to this lack of a clear conception of the mechanism of natural corrosion on the part of the electrical and mechanical engineers that they have displayed so little interest in the subject, and have so tardily availed themselves of the knowledge of the phenomena now at their disposal.

In dealing with problems of corrosion the engineer is satisfied if he can explain a phenomenon by stating "that a galvanic cell is set up". Thus a piece of coal in contact with an iron plate or a bit of mill scale on a pipe will cause a pit to form "because it sets up a galvanic cell". From a chemical point of view both the coke and the mill scale are perfectly inert; how then can they cause galvanic action—what role do they play in the solution of the iron which produces a pit?

Corrosion is an electrolytic phenomenon and can be understood by electrical engineers on purely electrochemical grounds. It takes place at ordinary temperatures only in the presence of water through the reaction

$$Fe + 2H^{\cdot} \longrightarrow Fe^{\cdot\cdot} + 2H$$

This reaction means that a metallic iron atom electrically neutral interacts with two hydrogen ions present in the water. The hydrogen ions carry electrical charges and the result is the production of an iron ion which takes up the two electrical charges from the hydrogen ions, also two atoms of hydrogen are deposited. Energy is lost to the surroundings and appears as electricity and heat.

The factors which influence the action may be segregated into five groups. First, the solution pressure of the iron is constant for all samples of iron under constant conditions, but may be influenced by a number of agents. Thus the immunity of iron to corrosion in solutions of chromic acid is undoubtedly caused by the passivity of the iron, a thing which whatever its true nature, is equivalent to lowering the electrolytic solution pressure of the metal.

The impression of an external electromotive force may also be considered as equivalent to a change in solution pressure. This pressure may be either positive or negative in its direction. If the potential employed be generated mechanically, we speak of it as a stray current, but if electrochemical in its origin, it is described as the accelerating or retarding effect of other bodies. Thus iron, which itself is incapable of corrosion when imbedded in concrete, is severely attacked if its solution pressure be sufficiently increased by having superimposed upon its own potential an external electromotive force due to stray currents. On the other hand, the potential of iron may be so depressed by an impressed electromotive force due, for example, to the solution pressure of zinc, that the iron in contact with zinc will not corrode.

The second factor in corrosion of iron is the number of hydrogen ions present. The greater the concentration, the more rapid will be the corrosive action. Hence, if any substance forming hydrogen, such as carbonic acid or bicarbonate or sulphur dioxide or any acid-forming compound, be present, corrosion is accelerated. On the other hand, if an alkaline material such as soda ash or caustic soda be present, the number of hydrogen ions is decreased and corrosion is retarded. If enough hydroxyl, the active ion of an alkaline compound, be present, practically all of the hydrogen will disappear and corrosion will cease to exist.

The third determining factor in corrosion is the ease with which the hydrogen ion reaches the iron. For example, the alleged resistance of sheet steel containing small quantities of copper to corrosion when used as roofing is unquestionably due to the adherent nature of the film of oxide produced when corrosion starts. This film, as in the case of the aluminum oxide coat on metallic aluminum, insulates the metal and is believed to practically prevent further corrosion.

The fourth factor is the osmotic pressure of the iron ions. This is so small in any case that it is negligible; in the presence of oxygen the pressure is kept extremely low owing to the formation of insoluble iron hydroxide.

The fifth influence is deposition of the hydrogen and its removal by the depolarizing action of oxygen. The accelerating action of metals such as platinum, copper, and lead, and materials such as coke and mill scale upon the corrosion of iron are undoubtedly due solely to the aid these bodies offer to the elimination of hydrogen produced by the corrosion reaction. This is due to the low overvoltage of hydrogen upon these substances and to the high catalytic action of these materials on the hydrogen-oxygen reaction by which the deposited hydrogen film is removed.

While in specific cases the corrosion of iron can be absolutely controled by first one and then another of these factors, too little attention is generally paid to the influence exerted by the disposition of the hydrogen and its removal by the depolarizing action of oxygen.. The retarding action of the hydrogen film which is stable in the absence of oxygen and any acid-forming compound is so controling that from this point of view, oxygen, or air, may be said to be the cause of corrosion. If oxygen be completely removed from boiler feed water, the boilers will not pit or corrode. If oxygen be separated from the feed of ordinary hot water supply lines, the red-water plague and other corrosion troubles will be reduced to a minimum if not entirely eliminated.

A paper read at the annual meeting of the American Electrochemical Society, Washington, D. C., April 27-29, 1916.

Will be Ready to Serve Uncle Sam

Westinghouse Company Will Not Dispose of Shell-Making Equipment —Has Completed Large Order for England

OWNERS of rolling mills and machine shops in the Greater Pittsburgh district say they have not been called upon recently to furnish steel rounds, shells or munitions to the United States government. Immediately after the situation along the Rio Grande and beyond started to assume somewhat serious aspects, manufacturers in western Pennsylvania took hasty surveys of their plants, to ascertain the extent to which they could serve the government. Data are being collected for the naval consulting board, which is taking steps to mobilize the industries of the country.

The Westinghouse Airbrake Co., Wilmerding, Pa., which has completed an order, taken 15 months ago, for 1,250,000 18-pound shrapnel shells for the British government, will not dispose of its shell-making equipment for an indefinite period, because of its desire to serve the United States government immediately if occasion should demand. The company has approximately 700 tools, including machines of the smallest type and presses weighing 12 tons and more, all of which can be brought into immediate service.

All of the machines and the buildings which house them will be disposed of eventually, but the company will not disturb its projectile department until assured beyond reasonable doubt that the United States will not want munitions of any kind in the near future. The company is filling a large order for brass time fuses for Great Britain, and may receive orders for additional shells for the entente nations.

"We entered into the manufacture of shells primarily for patriotic purposes," A. L. Humphrey, vice president and general manager of the company, told *The Iron Trade Review* a short time ago. "We have reserve capacity which has been offered our government, and we shall do our best to serve our nation if called upon for any product we can make."

As pointed out in these columns a week ago, recruiting stations were closed at Pittsburgh a few days after the first call went out for volunteers. Col. Henry P. Bope, vice president and general manager of the Carnegie Steel Co., who is in charge of the recruiting of men for the Eighteenth regiment of Pennsylvania, was unable to accept an invitation to be the honor guest of the regiment at Mt. Gretna, Pa., last week, because of the pressure of business. Col. Bope is major of ordnance attached to the second brigade. Many of the boys he instructed in military training a few years ago, when he was active head of the boys' brigade here, were among the first to respond to the initial call for troops. Requests to have Col. Bope organize a volunteer regiment, composed of young business men, would be very urgent, if hostilities broke out along the Mexican border, or elsewhere. His activity in the affairs of the national guard, his popularity, and his sound judgment in the selection of recruits, largely are responsible for the excellent personnel of the Eighteenth regiment.

Courtesy of Pittsburgh Sun

COL. H. P. BOPE ADMINISTERING OATH TO A RECRUIT

May Not Be Needed

Officials of the big arms plants in Bridgeport, Conn., say that none of them will be needed or taken by the United States government in case of war with Mexico. Edward Allen, an official of the Remington Arms-Union Metallic Cartridge Co., says that in the event of a war the company would not attempt to make ammunition for an enemy nation. John M. French, until recently publicity manager of the Remington company, says that the company is making rifles and bayonets for the French and Russian armies, and that it would be necessary to make new dies, a labor of about seven months, if the company should begin work for the American government. He thought it unlikely that the company would begin such work. The government manufactures the present Springfield army rifle at the arsenals in Springfield, Mass., and Rock Island, Ill. This is considered by experts the best military rifle in the world. Bayonets are also manufactured at both these arsenals. The Union Metallic Cartridge Co. made small arms ammunition and big shells and projectiles for the government during the Spanish-American war and might do so again in the event of war with Mexico, but Mr. Allen believes such manufacturers would be under contract without the government taking over the plants.

Daniel Edmund Garrison, president of the Corrugated Bar Co., of St. Louis, died at his home in that city, July 4, at the age of 77 years. Death was due to uraemic poisoning.

Business News of Nation's Capital

Munition Makers Protest Vigorously Against Proposed Taxation —Important Features of Revenue Bill

Bureau of *The Iron Trade Review*,
206 Corcoran Bldg.,
Washington, D. C., July 10, 1916.

STRONG protests have been made to members of congress by munition manufacturers against taxes on their products provided for in the omnibus revenue bill. The measure was sharply debated, Republicans assailing it, and, as a general thing, making a tariff argument out of it. They asserted that the failure of the Underwood-Simmons law to derive required revenue was largely to blame for the necessity of the taxing measure.

The bill passed the house of representative last evening.

It is claimed by munition makers that the tax is not only inequitable in its provisions, but also that it singles out a special industry to raise revenue, while other legitimate sources for securing added funds are exempted from taxation. In particular, it was stated that copper, steel and powder are not the only articles that are going into the manufacture of munitions of war. In this connection, Representative Joseph W. Fordney, of Michigan, ranking Republican member of the ways and means committee, referred to a letter he had received, showing that one firm in this country, since the war broke out in Europe, in August, 1914, has consumed 611,000 bales of cotton in the manufacture of explosives. The letter also called attention to the consumption of approximately 300,000 bales of cotton used by other manufacturers in making explosives for export. In round numbers, said Mr. Fordney, in 23 months, $70,000,000 worth of American grown cotton has gone into the manufacture of explosives. He demanded to know why there was no tax placed on cotton, if it is fair to put a tax on copper.

In a telegram to Representative W. Frank James, of Michigan, James McNaughton, Calumet, a manufacturer of copper, attacked the form of the tax proposed on copper. Mr. McNaughton said the tax is unfair to copper mines and strikes a serious blow to the copper mining industry. Indications are that the protests coming from makers of munitions against the taxes may result in hearings before the senate sub-committee of the committe on finance, which has taken charge of the bill before reporting it to the senate. This sub-committee consists of Senator Stone, of Missouri, chairman; Senator Thomas, of Colorado, and Senator Hughes, of New Jersey. It is proposed to raise $71,000,000 by the tax on munitions. The entire revenue it is expected to raise by the bill is $197,000,000, so that the munition tax would represent 36 per cent of the total.

The tax on munitions is graduated and provides for a tax of 5 per cent on the gross receipts of the manufacture of gunpowder or other explosives where the amount is not in excess of $1,000,000. If it is in excess of that amount, then the tax shall be 8 per cent of the gross receipts which exceed $1,000,000. The tax on cartridges, projectiles or shells of any kind, including shrapnel, torpedoes, or fuses and firearms of any kind, including small arms, cannons, machine guns, rifles and bayonets, or any parts of the articles mentioned, shall be 2 per cent of gross receipts not in excess of $250,000; 3 per cent of the amount by which such gross receipts exceed $250,000 and do not exceed $500,000; 4 per cent of the amount by which such receipts exceed $500,000 and do not exceed $1,000,000; and 5 per cent on all over $1,000,000, smelting and refining, there shall be a tax of 1 per cent of the amount by which such receipts shall exceed $25,000 and do not exceed $1,000,000; 2 per cent of the amount by which such receipts exceed $1,000,000 and do not exceed $10,000,000; and 3 per cent of the amount by which such receipts exceed $10,000,000.

In all instances where munition plants fail to make a net profit of 10 per cent this tax will not be collected, and if the payment of the tax would reduce such net profit below 10 per cent the tax to be paid shall be equal to the net profit in excess of 10 per cent. The net profit is to be arrived at by means of making allowances for the cost of raw materials, overhead expenses, wages and salaries, capital investment, etc.

Criticism has been made because the taxation is on gross receipts instead of on net profits. It has been assailed as being a new form of taxation, and one that is unfair and extremely heavy. It is claimed that the fact that the plan imposes a graduated rate which does not reach 5 per cent until gross receipts have passed $1,000,000 carries no great advantages because few concerns now turning out munitions for the allies have contracts valued at only $1,000,000 or less for delivery during the year. One munition maker has cited an example as to how the tax would work. He said he had a contract calling for shipments which will bring his gross receipts for the year up to $10,000,000. Upon this he must pay to the government approximately $500,000. A fair profit to the manufacturer, he said, is generally estimated at from 20 to 25 per cent. Assuming that he is making 25 per cent, it was asserted the tax would then represent 20 per cent of his total receipts. He could not arrange for this in the contract, which is already signed. The only thing he can do is to provide for it in new contracts, which he said, would probably curtail his business.

The only important amendment to the munitions tax provision of the bill was one offered by Mr. Hull, Democratic member of the ways and means committee, adding smelters of copper concentrates to the list of those who will be subjected to the tax.

In addition to providing taxation for revenue, the bill carries legislation creating a tariff commission, increasing duties on dyestuffs and providing for an anti-dumping clause.

The Longworth amendment to the tariff commission section permitting former and present members of congress to act as members of the commission was adopted.

American Can Case

Washington, July 11.—The government will appeal from the decision of Judge Rose at Baltimore in the American Can Co. case, according to an announcement made by Assistant Attorney General Todd. Mr. Todd has charge of the government's side in its prosecution to dissolve the company. Judge Rose last Friday signed a final decree in the suit and refused the motion of the government to dissolve the company and also dismissed the defendant's motion for dismissal of the case. Judge

Rose said he will retain jurisdiction in the case and permit the can company to continue as it is unless by its actions it injures the public and makes necessary a decree of dissolution.

"If the Supreme Court holds this to be a final decree," said Mr. Todd, "we can appeal, and if it is held not to be a final decree, the government will seek a writ of mandamus to compel the lower court to file a final decree.

"Judge Rose admitted that the can company was organized as a combination in restraint of trade, but refused to dissolve the company or to dismiss the case. After determining that the company was organized as an illegal combination, the question arising is whether it has ceased to be in restraint of trade. The court apparently was not thoroughly convinced that it had ceased to be."

Vessel Building

Washington, July 11.—The bureau of navigation, department of commerce, made public last Saturday a report showing 1,030 vessels of 347,847 gross tons were built in the United States and officially numbered during the fiscal year ended June 30, last, compared with 1,226 vessels of 215,711 gross tons during the fiscal year ended June 30, 1915. Seaboard yards built 35 large steel merchant steamers, aggregating 191,859 gross tons, the largest merchant steel vessel output in their history. Of these, 21 steamers are each of 5,000 gross tons, the largest being the steamer H. H. Rogers, of 10,050 gross tons, and 14 are between 3,000 and 5,000 gross tons each. The Newport News Shipbuilding & Dry Dock Co., Newport News, Va., built six of 40,329 gross; Maryland Steel Co., Sparrows Point, Md., eight of 35,665 gross; Union Iron Works, San Francisco, five of 32,665 gross; New York Shipbuilding Co., Camden, N. J., seven of 32,164; and Fore River Shipbuilding Co., Quincy, Mass., four of 24,932. The Newport News, Camden and Quincy yards were also engaged in naval construction.

Machinery in Argentina

The bureau of foreign and domestic commerce, department of commerce, Washington, D. C., has issued an exhaustive treatise entitled "Markets for Machinery in Argentina". This report, which contains 63 pages, was prepared by J. A. Massel, special agent of the department. Mr. Massel is a mechanical engineer, well versed in commercial affairs. He also is thoroughly at home in Latin-American countries. Previous to the war, Argentina purchased practically all of its machinery and machine tools abroad, principally from England and Germany. In this competition, the United States has been a rather poor third. Our manufacturers now have an opportunity to get more of this trade and to keep it. The report prepared by Mr. Massel goes into the question of machinery sales in South America very thoroughly, covering a large number of different products.

Wage Advance

Washington, July 11.—Chicago has been included with Rock Island and Moline, Ill., and Davenport, Ia., in determining the wages that shall be paid by the government to employes at the Rock Island arsenal. This will result in an increase of about 25c per day for the employes and represents a victory for them in their contention with the war department.

Electro-Platers' Convention

The fourth annual convention of the American Electro-platers' Society, which was held in Cleveland, July 6, 7 and 8, was attended by more than 100 electro-platers from the United States and Canada. The president reported that the society had passed through an unusually successful year and that its strength was rapidly increasing. The total membership at present is 618, included in 15 branches. The editor of the society's official publication stated that Cleveland took the lead among the branches by furnishing 11 technical papers for the monthly journal during the year. Chicago ranked second with seven papers. Officers were elected as follows: President, H. H. Williams, Quick Meal Stove Co., St. Louis; vice president, Oscar Servis, Felt & Tarrant Co., Chicago; secretary-treasurer, Walter Fraine, National Cash Register Co., Dayton, O.; and editor, H. J. Richards, Koken Barber Supply Co., St. Louis. The last two officers were re-elected. The convention will be held in St. Louis next year.

One of the features of the meeting was an exhibition by manufacturers of plating accessories. The program included a number of technical papers, a tour through Cleveland parks and a visit to several factories.

Frank M. Riley, owner of the Riley Machine Works, Brooklyn, died June 28, aged 43 years.

Benzol Market

Shows Effect of Continuance of Demand —Not Many Contracts

New York, July 11.—Prices on spot pure benzol are stronger under a continuing demand which is greater than the available supply and the minimum of the market now is 75 cents per gallon at the producer's plant while occasionally higher is paid. The volume of transactions is not large nor is the demand active, but offerings are restricted and it is expected by leading interests that this condition will be prolonged for some months in view of the way producing capacity has been booked against. There is little new business in contract benzol which is unchanged in price. Constant inquiries for contract toluol are coming out from foreign governments whose purpose at present seems mainly to keep in close touch with supplies for possible future needs, as few orders are being closed. Prices in this product are indefinite because sales are lacking, but $4.50 per gallon for both spot and contract is the nominal figure. Current consumption just about absorbs the new supply. Larger offerings of solvent naphtha have appeared and these are being taken readily at 45 cents per gallon for spot and 40 cents for contract.

More contracts for sulphate of ammonia, delivery over the next 12 months, were closed in the week at the established prices by fertilizer manufacturers. This movement is likely to continue for some weeks. Prices incline toward greater firmness. There is practically no spot demand.

The current quotations per gallon at the maker's plant on leading coke oven by-products, are as follows:

Pure benzol, spot	$0.75 to .80
Pure benzol, contract	.70
Toluol, spot	4.50
Toluol, contract	4.50
Solvent naphtha, spot	.45
Solvent naphtha, contract	.40

Sulphate of ammonia is $3.25 to $3.35 per 100 pounds at tidewater for both spot and contract.

Furnace Capacity

In the July 6 issue of *The Iron Trade Review* the Western Crucible Steel Casting Co., Minneapolis, Minn., was reported to have purchased a 400-kilowatt Snyder electric furnace, which will melt 2,800 pounds of steel every 24 hours. This should have read 28,000 pounds.

Michael J. Harrington, a retired iron manufacturer of Brooklyn, died at his home in that city, June 26, aged 76 years.

Production of Steel Ingots and Castings and Finished Rolled Iron and Steel

Statistics Compiled by Bureau of Statistics American Iron and Steel Institute

PRODUCTION OF STEEL INGOTS AND CASTINGS BY PROCESSES.

Years	Open-hearth. Basic.	Open-hearth. Acid.	Open-hearth. Total.	Bessemer.	Crucible.	Electric.	Miscellaneous.	Total. Gross tons.
1901.	3,618,993	1,037,316	4,656,309	8,713,302	98,513	.....	5,471	13,473,595
1902.	4,496,533	1,191,196	5,687,729	9,138,363	112,772	.....	8,386	14,947,250
1903.	4,734,913	1,094,998	5,829,911	8,592,829	102,434	.....	9,804	14,534,978
1904.	5,106,367	801,799	5,908,166	7,859,140	83,391	.....	9,190	13,859,887
1905.	7,815,728	1,155,648	8,971,376	10,941,375	102,233	.....	8,963	20,023,947
1906.	9,658,760	1,321,653	10,980,413	12,275,830	127,513	.....	14,380	23,398,136
1907.	10,279,315	1,270,421	11,549,736	11,667,549	131,234	.....	14,075	23,362,594
1908.	7,140,423	696,304	7,836,729	6,116,755	63,631	.....	6,132	14,023,247
1909.	13,417,472	1,076,464	14,493,936	9,330,783	107,355	13,762	9,185	23,955,021
1910.	15,292,329	1,212,180	16,504,509	9,412,772	122,303	52,141	3,194	26,094,919
1911.	14,685,932	912,718	15,598,650	7,947,854	97,653	29,105	2,844	23,676,106
1912.	19,641,502	1,139,221	20,780,723	10,327,901	121,517	18,309	2,853	31,251,303
1913.	20,344,626	1,255,305	21,599,931	9,545,706	121,226	30,180	3,831	31,300,874
1914.	16,271,129	903,555	17,174,684	6,220,846	80,869	24,009	3,622	23,513,030
1915.	22,308,725	1,370,377	23,679,102	8,287,213	113,782	69,412	1,527	32,151,036

PRODUCTION OF STEEL INGOTS.

1901.	3,524,052	830,635	4,354,687	8,706,538	94,586	.....	214	13,156,025
1902.	4,384,129	935,721	5,319,850	9,125,815	107,817	.....	2,833	14,556,315
1903.	4,000,034	829,529	5,429,563	8,574,730	97,025	.....	3,395	14,104,713
1904.	5,007,448	597,884	5,605,332	7,843,089	79,083	.....	2,172	13,529,676
1905.	7,609,569	835,267	8,444,836	10,919,272	96,500	.....	2,572	19,463,180
1906.	9,345,212	915,310	10,260,522	12,243,229	117,170	.....	3,510	22,624,431
1907.	9,912,839	890,372	10,803,211	11,634,276	121,001	.....	989	22,559,477
1908.	6,985,420	539,532	7,524,952	6,096,196	55,360	.....	519	13,677,027
1909.	13,111,467	781,429	13,892,896	9,296,969	94,672	13,456	786	23,298,779
1910.	14,858,353	782,805	15,641,158	9,354,437	107,671	50,821	....	25,154,087
1911.	14,419,300	608,153	15,027,459	7,890,753	83,623	27,227	417	23,029,479
1912.	19,197,504	712,371	19,909,875	10,259,151	100,967	14,147	542	30,284,682
1913.	19,884,465	805,250	20,689,715	9,465,200	103,655	20,973	587	30,280,130
1914.	15,936,985	633,382	16,570,367	6,154,964	78,683	15,458	312	22,819,784
1915.	21,975,622	968,148	22,943,770	8,194,737	99,026	46,348	331	31,284,212

PRODUCTION OF STEEL CASTINGS.

1901.	94,941	206,681	301,622	6,764	3,927	.....	5,257	317,570
1902.	112,404	255,475	367,879	12,548	4,955	.....	5,553	390,935
1903.	134,879	265,469	400,348	18,009	5,409	.....	6,409	430,265
1904.	98,919	203,915	302,834	16,051	4,308	.....	7,018	330,211
1905.	206,159	320,381	526,540	22,103	5,733	.....	6,391	560,767
1906.	313,548	406,343	719,891	32,601	10,343	.....	10,870	773,705
1907.	366,476	380,049	746,525	33,273	10,233	.....	13,086	803,117
1908.	155,005	156,772	311,777	20,559	8,271	.....	5,613	346,220
1909.	306,005	295,035	601,040	33,814	12,683	306	8,399	656,242
1910.	433,976	429,375	863,351	58,335	14,632	1,320	3,194	940,832
1911.	266,626	304,565	571,191	57,101	14,030	1,878	2,427	646,627
1912.	443,998	426,850	870,848	68,750	20,550	4,162	2,311	966,621
1913.	460,161	450,055	910,216	80,506	17,571	9,207	3,244	1,020,744
1914.	334,144	270,173	604,317	65,882	11,186	8,551	3,310	693,246
1915.	333,103	402,229	735,332	92,476	14,756	23,064	1,196	866,824

PRODUCTION OF MISCELLANEOUS ROLLED PRODUCTS, GROSS TONS, 1911–1915.

Products.	1911.	1912.	1913.	1914.	1915.
Hoops	225,074	270,007	280,886	211,028	281,759
Bands and cotton-ties	342,810	587,395	499,660	345,919	437,987
Long angle splice bars, fish-plate bars, tie-plate bars, etc	*	571,772	686,390	423,052	535,615
Rolled sheet piling	22,827	22,276	46,289	35,314	24,026
Railroad ties	39,197	41,396	44,244	33,249	42,269
Rolled forging blooms and forging billets	231,115	462,476	537,210	331,524	650,545
Blooms, billets, sheet bars, tinplate bars, etc., for export	*	347,783	88,778	91,907	562,418
Spike and chain rods, bolt and nut rods, horseshoe bars, strips, shafting, tires, etc	1,169,191	1,187,108	1,067,444	937,918	1,227,455
Total	2,030,214	3,490,213	3,250,901	2,409,911	3,762,074

* Statistics not collected from the manufacturers prior to 1912.

TOTAL PRODUCTION OF ALL KINDS OF FINISHED ROLLED IRON AND STEEL, 1887–1915.

Years	Iron and steel rails.	Plates and sheets.	Nail plate.	Wire rods.	Structural shapes.	All other finished rolled produc ts	Total. Gross tons.
1887.	2,139,640	663,355	308,432	.....	.....	2,184,279	5,235,706
1888.	1,403,700	609,827	289,891	279,769	.....	2,034,162	4,617,349
1889.	1,522,204	716,496	259,409	363,851	.....	2,374,968	5,236,928
1890.	1,885,307	809,981	251,828	457,099	.....	2,618,660	6,022,875
1891.	1,307,176	678,927	223,342	536,607	.....	2,644,941	5,390,963
1892.	1,551,844	751,460	201,242	627,829	453,957	2,579,482	6,165,814
1893.	1,136,458	674,345	136,113	537,272	387,307	2,104,190	4,975,685
1894.	1,021,772	682,900	108,262	673,402	360,305	1,795,570	4,642,211
1895.	1,306,135	991,459	95,085	791,130	517,920	2,487,845	6,189,574
1896.	1,122,010	965,776	72,137	623,986	495,571	2,236,361	5,515,841
1897.	1,647,892	1,207,286	94,054	970,736	583,790	2,497,970	7,001,728
1898.	1,981,241	1,448,301	70,188	1,071,683	702,197	3,239,760	8,513,370
1899.	2,272,700	1,903,505	85,015	1,036,398	850,376	4,146,425	10,294,419
1900.	2,385,682	1,794,528	70,245	846,291	815,161	3,575,536	9,487,443
1901.	2,874,639	2,254,425	68,850	1,365,934	1,013,150	4,772,329	12,349,327
1902.	2,947,933	2,665,409	72,936	1,574,293	1,300,326	5,383,219	13,944,116
1903.	2,992,477	2,599,665	64,102	1,503,455	1,095,813	4,952,185	13,207,697
1904.	2,284,711	2,421,398	61,601	1,699,028	949,146	4,597,497	12,013,381
1905.	3,375,929	3,532,230	64,542	1,808,688	1,660,519	6,398,107	16,840,015
1906.	3,977,887	4,182,156	54,211	1,871,614	2,118,772	7,383,828	19,588,468
1907.	3,633,654	4,248,832	52,027	2,017,583	1,940,352	7,972,374	19,864,822
1908.	1,921,015	2,649,693	45,747	1,816,949	1,083,181	4,311,608	11,828,193
1909.	3,023,845	4,234,346	63,746	2,335,685	2,275,562	7,711,506	19,644,690
1910.	3,636,031	4,955,484	45,294	2,241,830	2,266,890	8,475,750	21,621,279
1911.	2,822,790	4,488,049	48,522	2,450,453	1,912,367	7,316,990	19,039,171
1912.	3,327,915	5,875,080	45,331	2,653,553	2,846,487	9,908,475	24,656,841
1913.	3,502,780	5,751,037	37,503	2,464,807	3,004,972	10,030,144	24,791,243
1914.	1,945,095	4,719,246	38,573	2,431,714	2,031,124	7,204,444	18,370,196
1915.	2,204,203	6,077,694	31,929	3,095,907	2,437,003	10,546,188	24,392,924

PRODUCTION OF PLATES AND SHEETS BY SIZE AND MODE OF MANUFACTURE, GROSS TONS, 1915.

Kinds of products.	Iron.	Steel.	Total.
Universal plates, inc. flats or bars over 6 in. wide:			
¼ of an inch and over in thickness	1,525	903,501	905,026
Under ¼ of an inch thick	.....	49,826	49,826
Total universal plates	1,525	953,327	954,852
Sheared plates:			
¼ of an inch and over in thickness	562	1,458,860	1,459,422
Under ¼ of an inch thick	200	463,577	463,777
Total sheared plates	762	1,922,437	1,923,199
Black sheets, made on either sheet or job. mills:			
No. 12 gauge and thicker	1,152	159,057	160,209
No. 13 gauge and thinner	14,776	1,661,801	1,676,577
Total black sheets	15,928	1,820,858	1,836,786
Black plates rolled on tin mills:			
Black plates for tinning	2,038	1,091,307	1,093,345
Other black plate specialties	.....	269,512	269,512
Total black plates rolled on tin mills	2,038	1,360,819	1,362,857
Grand total of plates and sheets	20,253	6,057,441	6,077,694

PRODUCTION OF MISCELLANEOUS ROLLED IRON AND STEEL PRODUCTS, GROSS TONS, 1915.

Miscellaneous rolled products.	Iron	Steel.	Total.
Hoops	300	281,459	281,759
Bands and cotton-ties	200	437,787	437,987
Long angle splice bars, fish-plate bars, tie-plate bars, and other rail joint shapes	54,678	480,937	535,615
Rolled sheet piling, not including fabricated	.....	24,026	24,026
Railroad ties	.....	42,269	42,269
Rolled forging blooms, forging billets, etc	570	649,975	650,545
Blooms, billets, sheet bars, etc., for export	1,231	561,187	562,418
Spike and chain rods, bolt and nut rods, horseshoe bars, strips, etc	289,218	938,237	1,227,455
Total	346,197	3,415,877	3,762,074

Judge Gary Says

This Country Should be Prepared by Reasonable Protection

New York, July 10.—Present business prosperity in the United States will not end abruptly with the close of the European war because of the great momentum that has been acquired, but its termination is only a matter of limited time unless wise measures including protection are taken to safeguard it, is the opinion set forth by Chairman E. H. Gary, of the Steel Corporation, in an article in the current number of System on the subject "How Shall We Prepare for Peace?" The greatest danger under current conditions, according to Judge Gary, is a refusal to recognize the unstaple factors and to make ample provision for their strengthening. He believes the coming competition by foreign countries will be the most severe ever faced by the manufacturers and workmen of the country.

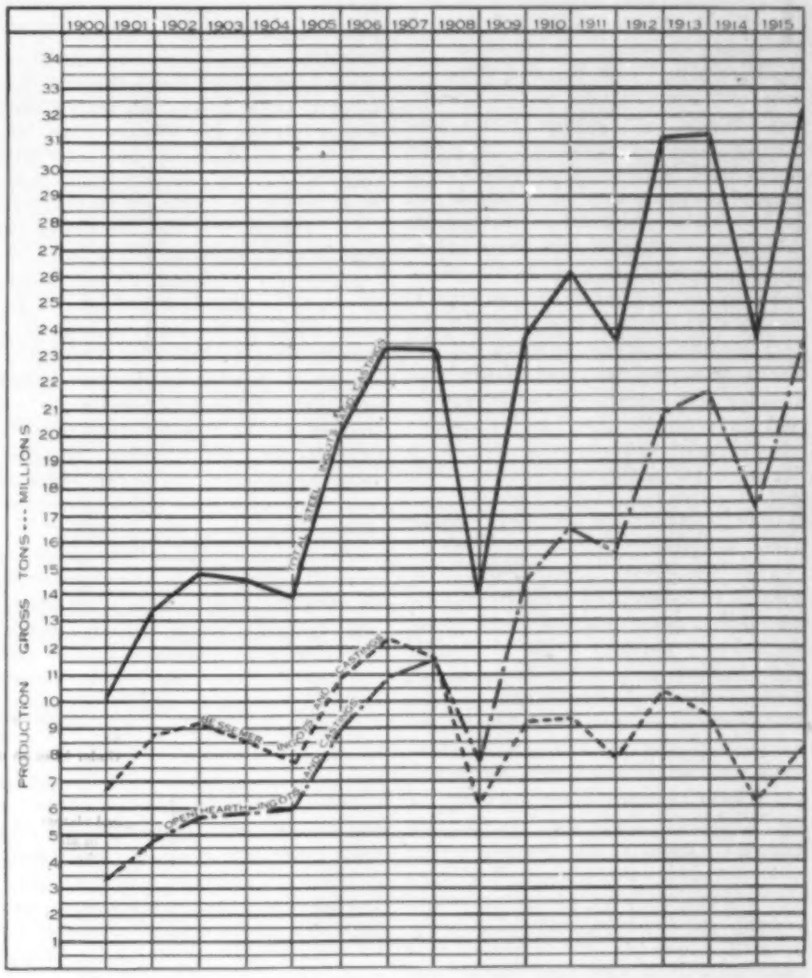
Judge Gary says in part:

"Our producers, including our wage earners, will find themselves in commercial antagonism with the most persistent competition ever experienced. Most of the foreign producing countries, and probably all of them, will be thoroughly protected by tariff provision, and we should be equally protected by reasonable and sufficient laws. This question of protection ought not to be one of politics, for it is a question of economics and good business; it affects all the people, and any protection which is given must be given with a view to the needs of all the people."

Bonus Plans

Bonus systems recently installed in New Britain, Conn., factories are proving satisfactory to employes and employers. At the Stanley Rule & Level Co., where the average bonus is 10 per cent of the daily wage, it was recently announced that company will make the first payment of the bonus Oct. 1. It will cover the months of May and June. The plan was started May 1. The second payment will be made in January, 1917, covering the six months commencing July 1, 1916, and after the first of the year, payments will be made semi-annually for the preceding six months.

The Fafnir Bearing Co., one of the smallest and yet one of the most progressive of New Britain's industries, makes bonus payments every three months. At this factory, day and night shifts are used, and the men on the night shift receive 20 per cent of their wages and the day shift, 10 per cent. The recently inaugurated plan of the Landers, Frary & Clark Co., whereby everybody but the officers of the company is benefitted, restrictions are laid on the factory employes. They receive a bonus with a provision regarding punctuality in arriving at work and the number of days worked. At the recent payment of wages to the office force, the first payment of bonus was made and everybody seemed satisfied.



PRODUCTION OF STEEL INGOTS AND CASTINGS, 1900-1915

Annual Field Day

The Brown-Wales Co., Boston, held its first annual field day on a recent Saturday at Abington, Mass., and it was a decided success. The program included an address by the president of the company, William Q. Wales, races, dancing and a general good time. The good fellowship which has been established among the employes of the company has resulted in plans for a moonlight excursion to be given next month down Boston harbor and also a dancing party for the coming fall.

Coal and Coke

Make a New Record of Production in First Half of Year

The output of bituminous coal in the United States during the first six months of 1916 was the greatest ever recorded in any half-year period. Estimates by C. E. Lesher, of the United States geological survey, based on returns from over 100 railroads originating coal and coke shipments, indicate that the production during this period was 261,000,000 tons, an increase of 35 per cent over the first six months of 1915, and of 5 per cent over the last six months of the same year, and greater by several million tons than the record established in the last half of 1913. Compared with the first half of 1915 the exports from the Atlantic seaboard during the last six months have increased about 10 per cent, and the exports to Canada have nearly doubled. The movement of bituminous coal through the Soo canal on the Great Lakes shows an increase of 80 per cent.

Great Union of Many Industries

Is Proposed in Great Britain to Meet Post Bellum Problems—Hope for More Friendly Relations of Labor and Capital

Bureau of *The Iron Trade Review*,
Prince's Chamber, Corporation St.,
Birmingham, Eng., June 30, 1916.

IT IS already apparent that one effect of the war will be a great extension of industrial organization in Great Britain. The extent and ramifications and far-reaching objects of German trusts and combinations revealed by the war have made a great impression upon English business men, many of whom are somewhat ashamed of the way in which their country, and their industries in particular, have been caught napping. The Australian premier, Sir W. M. Hughes, has taken as the text for the eloquent orations he has been delivering up and down the country the subject of organization, and the reception given to his appeals shows that experience had, in a sense, prepared the minds of his hearers, usually comprising carefully selected business men, to move in the same direction.

The strongest combination ever formed in connection with British industry has been initiated by F. Dudley Docker, the head of the Metropolitan Carriage, Wagon & Finance Co., Ltd., of Birmingham, who convened the preliminary meeting at which the association was planned. It has now been definitely formed, and Mr. Docker stated at the recent meeting of his company that the membership embraced many of the leading industrial firms in the United Kingdom, the market value of whose aggregate capital was between eighty and ninety million pounds. At a meeting of the association a little later the amount named was fifty millions, so that the membership, on the financial basis, must have nearly doubled in about a fortnight. A remarkable feature of the organization is that it is to consist of not less than 100 preliminary members, each contributing an entrance fee of £1,000 each. It seems clear that this large financial qualification has attracted rather than deterred adherents. The reason assigned for this fee is that the association will have the real intelligent and interested assistance of the subscribers. The possession of so much capital will also enable the association to command the services of highly qualified men, and will also, in the words of the convention circular, "ensure a wide representation of the most important industrial interest in the country for the purpose of agreeing and carrying into effect a definite line of policy with regard to the many matters affecting British industry".

The association may now be regarded as a power to be reckoned with. So far, its objects have been only vaguely outlined; but it is pointed out that at present when industrial legislation is being framed only trade unions are consulted, for the reason that there is no organization representing business men to which any serious attention is paid. A second object is "to deal with labor on comprehensive lines. The trade unions have adopted the principle of collective bargaining and the employers of the country must have an organization big enough to make terms with labor—terms by which we may succeed in bringing about understanding and co-operation". A third object is "to bring about organized efforts for the furtherance of British trade interests in foreign and colonial markets; our existing methods are inadequate".

These objects have been authoritatively amplified, somewhat vaguely in various directions, but sufficiently to indicate the general ideas of the promoters. It is intended to prevent, for example, foreign control of raw materials, as well as to deal with foreign attempts to capture British and foreign markets. It is intended also to consider such questions as trade with dominions, with the allies, protection against German trade, relations between capital and labor, new methods of taxation and the solution of the unemployment problem. Another object will be a closer association between finance and industry, in view of the fact that orders will require financing more directly than heretofore by manufacturers themselves. The questions of providing credit and banking facilities suitable to novel conditions likely to follow the war, will also be kept in view. It is intended in particular to deal with whatever economic situation may arise, and especially to have an eye on German efforts to secure a footing in British markets after the war.

A great point is made of the desire to work in friendly associations with the trade unions for the general good of industry, and much is made also of the possibility of advising the government, while one of the first objects in view will be to urge the immediate appointment of a ministry of commerce. The members who have already joined the association represent the following industries: Iron and steel, coal, shipping, shipbuilding, railway construction, railway carriage building, electrical machinery, motor building, chemicals, cotton, rubber, agricultural implements, engineering and munitions.

Mr. Docker, who is the chairman of the Metropolitan company, availed himself of the annual meeting to further explain in general terms the views which have led to the evolution of this great organization. He states that some of the greatest of the business houses of the country are organizing to strengthen and consolidate the position of the manufacturing industries of the empire. It is not intended to define too narrowly the objects, but to get together first of all the manufacturing brains, the men of business experience, and keen commercial intelligence to exchange views, consult and decide on a policy fitted to cope with an altogether novel set of conditions. He believes that the government of the day will be glad to confer with a great representative body of manufacturers on all matters affecting trade. With regard to labor, he says: "Further, I trust it will be the happy means of bringing together into a partnership which can only be for mutual good capital and labor. At the front in the trenches such a one exists, and when the battle is won, should not this partnership be consummated at home? Speaking for myself, and I am sure for my company, there is nothing we should desire so much."

The American Electrochemical Society is preparing plans for a national convention to be held during the week of the second national exposition of chemical industries in New York, commencing Sept. 25. Several other important national societies will meet in New York during the same week. The meetings of the American Electrochemical Society will be held on Sept. 28, 29 and 30. The program, which has been arranged for three days, includes a smoker, a dinner-dance and several luncheons.

Iron and Money: Fact and Comment

Wall Street, More Deeply Impressed With Magnitude of Present Steel Earnings, Supports Steel Shares When Other Industrial Stocks Are Inclined to Weakness

WALL STREET seems to be growing more deeply impressed with the magnitude and importance of present earnings of the steel producers and the ultimate effect upon the financial status of these companies. This attitude is evidenced by the underlying strength which has been manifested by the steel shares all through July, whereas the munition stocks and other industrials have displayed a downward tendency. Despite their weakness, the so-called "war stocks" have been acting in a very satisfactory manner. Stocks which flew sky-high when the war order fever broke out 15 months ago, are now descending by easy stages to safer and saner levels.

Financial circles are watching the money markets closely but confidently as rates gradually are growing firmer. The public has given the matter little attention, having perfect confidence in the federal reserve system. The general business situation seems to be founded too substantially on a fundamentally sound basis to be jarred seriously by any influence. Opinions differ now just as much as they did a few months ago as to the probable effect of the end of the war upon American business. By many the arrival in this country's ports of a German submarine with a cargo of chemicals and dyestuffs is a portent of what may be expected when peace comes.

Following is a table comparing quotations of iron and steel stocks on the New York stock exchange at the close of business July 1 and showing net changes in the past week:

	Close July 8.	Net chg.
American Can	53¼	+ ⅞
American Can, prfd.	109⅛	— ⅜
Amer. Car & Fdy.	52⅜	—1⅛
Amer. Car & Fdy., prfd.	115½	—1½
American Locomotive	64	—3¼
American Locomotive, prfd.	100	+ ⅜
American Steel Foundries	46¼	+ ¾
Baldwin Locomotive	69⅛	—3⅛
Baldwin Locomotive, prfd.	104½	+ ½
Bethlehem Steel	449½	+9½
Colorado Fuel & Iron	44¼	+2¾
Continental Can	102	+2
Crucible Steel	70	—3
Crucible Steel, prfd.	114½	— ⅜
General Electric	167½	+ ½
Gulf States Steel	81	.....
Gulf States Steel, 1st prfd.	96	+1
Gulf States Steel, 2d prfd.	86	.....
Internat'l Harv. of N. J.	113	— ⅜
Internat'l Harv. of N. J., pr.	118	—1½
International Harv. Corp.	82	+4
Lackawanna Steel	70½	+3⅛
Nat'l Enaml'g & Stamp. Co.	23⅞	+ ⅛
Pressed Steel Car	45½	—1⅞
Pullman Palace Car	163	— ⅛
Republic Iron & Steel	45½	+ ½
Republic Iron & Steel, prfd.	108	+ ½
U. S. Cast Iron Pipe & Fdy.	20⅛	+ ⅛
U. S. C. I. P. & Fdy., prfd.	52⅜	—1⅜
United States Steel	86⅛	+ ⅜
United States Steel, prfd.	117½	.....
Westinghouse Mfg.	56⅛	—1⅜

Following is a table showing high and low prices for a number of stocks which are not listed on the New York stock exchange:

	July 7.	June 30.
American Radiator	400	399
American Ship Building	44	44⅜
Cambria Steel	...	85
Chicago Pneumatic Tool	...	71½
LaBelle Iron Works	51¾	53
Lake Superior Corp.	11⅜	10⅜
Stewart-Warner Speed. Co.	100	100¼
Warwick Iron & Steel	9½	9½
Westinghouse Air Brake	144	145
Westinghouse Elec. & Mfg.	59⅛	59⅜

Financial Crop Ends

W. P. Worth and associates, who are planning the erection of a steel works along the Delaware river, have renewed for a period of two weeks from July 1 an option on a large tract of land at Claymont, Del. The Claymont property comprises a large acreage with good river facilities.

* * *

The Moline Malleable Iron Co., St. Charles, Ill., which recently increased its authorized capital stock from $75,000 to $100,000, advises the purpose of this action was to provide for the reconstruction of the plant after a destructive fire of last August. A modern foundry has taken the place of the destroyed plant.

* * *

E. M. S. Young, general manager of the Standard Steel Gage Co., Beaver Falls, Pa., announced several days ago that one-quarter of the controlling stock of the company had been sold for $1,250,000. The stock according to General Manager Young, was sold by A. Rasner, of Pittsburgh, retiring president of the company, and several workmen in the mills.

* * *

The Economy Trolley & Bushing Co., Springfield, Mass., recently incorporated under the laws of Massachusetts with an authorized capital stock of $100,000, advises it will manufacture and sell trolley wheels, harps and bushings. Decision to build a manufacturing plant has been reserved. The officers of the company are: President, L. J. Tetlow, and treasurer, John Aldrich.

* * *

The Florence Iron Works, on the Delaware river near Trenton, was sold at receiver's sale last week to Walter Wood, of Philadelphia a heavy stockholder in the concern. The plant, including real estate, buildings, fixtures, machinery, etc., was sold for $350,000, while the pig iron stock on hand brought $178,500, making a total of $528,500. The sale also included 209 of the company's dwelling houses, 32 acres of land, four miles of railroad, pumps supplying water to the plant and town, company's store, two forms and a town library.

Senator Harold B. Wells, who had been a receiver of the concern for a year and a half, has operated the works at a profit despite the fact that no war munitions were turned out. More than 800 workmen are now employed at the works.

* * *

Net earnings of the William Cramp & Sons Ship & Engine Building Co., Philadelphia, in the report for the year ending April 30, were $1,497,254, an increase of $956,796 over the earnings of the same period the previous year. The surplus was $1,087,704, as compared with $651,634 a year ago. The surplus this year is equal to 17.8 per cent of the $6,089,000 of stock outstanding. For the first time in the history of the company a fixed sum has been set aside for depreciation, this amounting to $197,787

* * *

Net earnings of the Allis-Chalmers Mfg. Co., Milwaukee, for May were $327,911, compared with $56,904 in May, 1915, an increase of $271,007. Five months' net earnings to May 31 were $1,359,733, compared with $86-506 for a similar period in 1915, an increase of $1,273,327. Dividends of 6 per cent per year on the $15,849,500 of preferred stock require $950,970, and so it is shown that these dividends have been earned in the first five months of the year. The outstanding common stock of the company is $25,770,800.

* * *

The Harbison-Walker Refractories Co., Pittsburgh, is said to be doing the biggest business in its history. The company has issued a report of its financial condition for the six months ended March 31, which contains the following figures: Surplus after all charges and dividends, $739,543. This is a most excellent showing, in view of the fact that for the entire previous fiscal year the surplus was only $562,889, or almost $200,000 less. If the earnings of the company continue at the present ratio it would seem that the company will have at the end of its current fiscal year a surplus of approximately $1,500,000.

* * *

A merger of the Signal Motor Truck Co. and the Commerce Motor Truck Co., both in Detroit, under a holding company to be known as the Signal-Commerce Motor Truck Co., Detroit, has been formed. This announcement was made Thursday by Thomas Neal, who will be chairman of the board of directors of the new company. The holding company will have a capitalization of $3,000,000 upon which will be issued 600,000 shares of stock of no fixed par value. Facilities for the production of motor trucks with carrying capacities ranging from ¾ ton to 6 tons are provided by the combination. Besides Thomas Neal, mentioned above, the board of directors includes Myron Neal, W. E. Parker, Arthur H. Buhl, and Thomas J. Bosquett, all of Detroit; and W. K. Hoagland, of Chicago.

Tool Prices Hesitate Then Slump

Second-Hand Machines Suffer Set-Back While New Tools Command Higher Figure —Foreign Sales Are Slack But Some New Business Pends

THE continued shrinkage in the volume of business in the machine tool market during the past few months finally has brought about the first downward revision of machine tool prices since the outbreak of the European war. Toward the end of last week several large houses which devote all or a portion of their attention to second-hand machine tools reduced their prices on equipment of this character by 25 to 30 per cent. This reduction applies to practically all kinds of used tools, with the exception of plain and universal grinders, and plain and universal milling machines. The demand for millers and grinders continues of sufficient proportions to take up the entire supply, and prospective buyers are willing to pay higher prices for these tools for prompt delivery. The reductions of last week first became effective on second-hand, medium size lathes, which now are plentiful, but later they extended to practically all the other tools with the above exceptions. The cause of the decline is not only the decreased demand, but the sudden broadening of the supply of second-hand tools. A number of concerns which up to recently were engaged in the manufacture of munitions on a large scale now are unable to secure further contracts at profitable prices and as a result they have no further use for the special equipment which they purchased. The Providence Engineering Works, Providence, R. I., is offering approximately $400,000 worth of lathes, planers, automatic turret lathes, shapers, grinders and some large, heavy tools used in the production of 3 to 6-inch shells. A number of other concerns have similar equipment for sale.

The recession in prices has not yet extended to new tools, since the makers still are so well sold ahead that it is too early for any weakness to be experienced. A surprising development, in fact, is a further upward tendency in new tool prices. One builder of tool grinders advanced his prices by 10 per cent a few days ago. A number of makers, although they did not formally raises their quotations,, showed a tendency to ask more for certain kinds of tools.

There is some further buying for export to Russia, Italy, England and France, and there are good inquiries out, especially from the first two countries. The foreign demand, however, is falling off. Domestic inquiry continues of fair proportions but consists entirely of small orders and there was a total absence of important transactions during the week. Railroad demand for machine tools excepting for minor requirements, is practically non-existent. The Baltimore & Ohio last week bought two 80-ton locomotive shop cranes.

Deutsch & Pollis, 50 Church street, New York, are taking bids for a foundry to be built at Farmingdale, L. I., N. Y. Gilbert & Barker Mfg. Co., West Springfield, Mass., is about to let contracts for the erection of additions to cost approximately $300,000. Covert Motor Vehicle Co., Lockport, N. Y., has let a contract for erecting a grinding shop. Manhattan Brass Co., New York, is about to put up a good-sized addition. New York Shipbuilding Co., Camden, N. J., has let a contract for erecting a large addition. Bonney Vise & Tool Co., Allentown, Pa., will build a plant. American Locomotive Co. has let a contract for the erection of a foundry at Schenectady, N. Y. Boston Screw Machine Co., Boston, will erect a plant in Cambridge, Mass. King Sewing Machine Co., Buffalo, will put up a new foundry. Crucible Steel Co. of America will build a wire mill at Syracuse, N. Y. Morrow Mfg. Co., Elmira, N. Y., let a contract for erecting another addition. Westinghouse Electric & Mfg. Co. is about to erect a plant on the Delaware river near Philadelphia. Newark Wire Cloth Co., Newark, N. J., will erect an addition. Ball Engine Co., Erie, Pa., will erect an addition. International Steel & Ship Building Co., a new concern in which Thomas Shay, Quantico, Va., is interested, has let a contract for the erection of a ship building plant to cost about $500,000. Irvington Smelting & Refining Co., Irvington, N. J., will erect a melting addition.

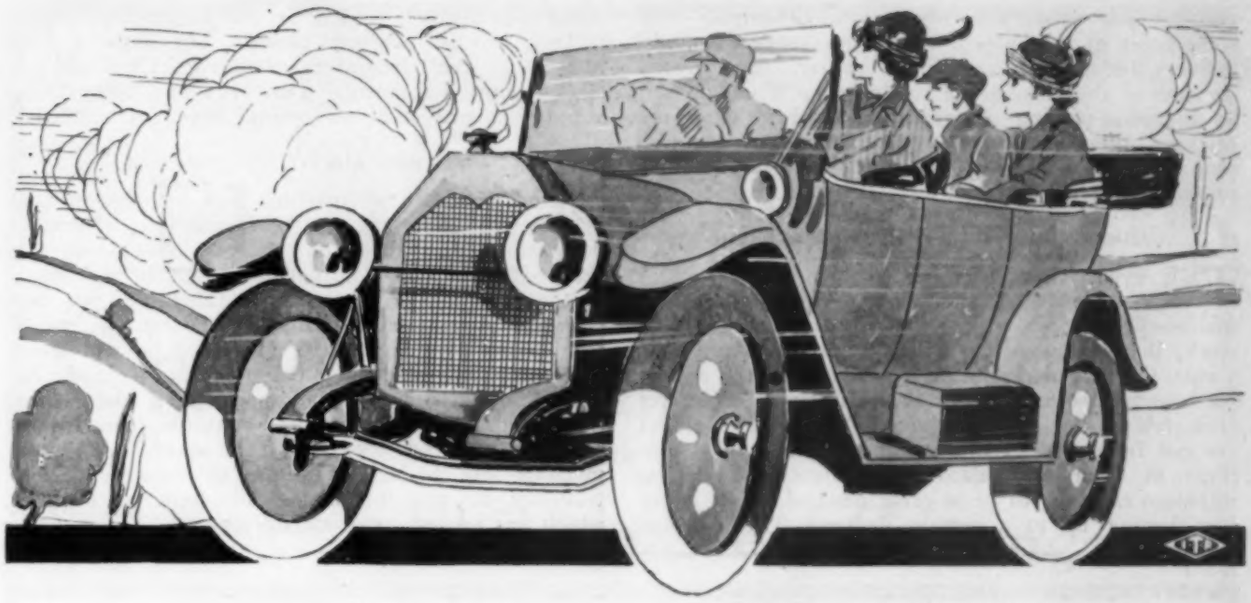
Japanese Inquiry Stirs Pittsburgh Builders

AN ANNOUNCEMENT that engineers, representing steel mills in Japan, had come to Pittsburgh to purchase rolling mill equipment involving more than $28,000,000 was read with interest by builders of heavy machinery in western Pennsylvania. Tentative inquiries for blast furnace and rolling mill equipment have been sent out by representatives of the Japanese government, but no actual orders have been placed recently, according to more important builders. Six months ago an order for a large plate mill was placed at Pittsburgh by the Imperial Steel Works, Wawata, Japan, but no additional orders have been received. The Donner Steel Co., Buffalo, has bought seven electric traveling cranes, including three 20-ton, two 15-ton and two 10-ton cranes, and the A. M. Byers Co., Pittsburgh, has purchased a 10-ton crane. The North East Foundry & Machine Co., North East, Pa., has been buying equipment for its foundry and machine shop. The Driggs-Seabury Ordnance Co., Sharon, Pa., has been buying additional machinery for the manufacture of trench tools, shells and munitions.

Reports that the Westinghouse Airbrake Co., Wilmerding, Pa., plans to dispose of its equipment for the manufacture of shells, are incorrect. The company has completed its contracts to manufacture 1,250,000 18-pound shrapnel shells for the British government, but is working on a large order for time fuses. While no inquiries for shells are pending for European nations or this government, officials of that company say they will not dispose of any equipment for six months or longer.

Chicago Market Quiet, But Steady

DEALERS in machine tools in the Chicago district find tool sales less active than during the first half of the year. Business continues to come from domestic buyers and a fair volume of shipments is being maintained. Foreign inquiry apparently has practically ceased as far as the west is concerned. Tool builders are giving better delivery and one of the most important manufacturers of lathes recently issued a list promising three months delivery, and in



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That is why automobile and motor truck builders use special care in selecting the materials they put into their products.

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Cleveland Office: Hickox Bldg., The Hamill-Hickox Co., District Representative
Chicago Office: Room 1511-12 Lytton Bldg., 14 East Jackson Blvd., A. Schaeffer, District Representative
Philadelphia Office: 902 Widener Bldg., Frank Wallace, District Representative

one instance delivery in 30 days was secured. On some types of machines it is still impossible to obtain delivery before late autumn or winter. The recent decision of the Providence Engineering Works to sell its munition-making equipment resulted in extensive sales of these machines to the Italian government. One Chicago dealer also has sold some large lathes to the Italian government.

Cleveland Market Maintains Steady Gait

THE even tenor of the Cleveland machine tool market is being maintained. In spite of the mid-week holiday which interrupted business last week, the volume of sales was unusually large. As a rule, the tool market suffers a slight set-back during the summer season, but this condition has not yet been felt in the local territory. While large orders are not frequent, but rather unusual, small sales continue to even the balance. Grinders and milling machines continue to be in great demand, while lathes are slowing up to a certain degree. The tool list which was recently issued by the Youngstown Sheet & Tube Co. has not been closed. The Richard Auto Mfg. Co., 322 Engineers' building, Cleveland, is buying some equipment. Deliveries are approaching a more normal state on several types of machines

Cincinnati Market Dropping Off

ORDERS taken by machine tool builders in Cincinnati during the month of June were of smaller proportions than those of any previous month this year, with the exception of April. Machine tool plants in that city are now running at about 95 per cent capacity, in comparison with 85 per cent on June 1, and 75 per cent on May 6. Railroad buying, which was encouraging during the middle of June, has dropped to almost nothing, purchases at the present time consisting of single tools. Inquiries from foreign countries have not been heavy for several months, as machine tool builders continue to show a decided tendency to give preference to domestic business, which has proved more satisfactory.

New Construction and Equipment

What it is **Where it is** **Who's doing it**

Among New England Factories

AUGUSTA, ME.—The Splitdorf Engine Co. has been incorporated to deal in motors and generators with $200,000 capital by R. S. Buzzell, president, L. J. Coleman, treasurer and C. L. Andrews.

BANGOR, ME.—Plans are being prepared for a brick and steel, fireproof, 3-story and basement, 80 x 195-foot business block to cost $100,000 for Charles W. Morse, on Harlow street.

PORTLAND, ME.—The Connecticut River Conservation Co. has been incorporated to do an engineering and contracting business with $200,000 capital by Benjamin B. Sanderson, president, E. E. Huston, treasurer, and Charles D. Booth.

THOMASTON, ME.—The shipbuilding plant of Washburn Bros., which has been idle for 15 years, has been leased by the Atlantic Coast Co., of which Walter D. Noyes is president and Lewis K. Thurlow is treasurer, both being of Boston.

BOSTON.—The Miller Trolley Shoe Co. has been incorporated with $200,000 capital by Otis T. Russel, Warren Motley, John C. Rice and Robert H. Holt.

BOSTON.—The Boston Machine Screw Co., 133 Oliver street, has let a contract to F. L. McKenzie, 7 Water street, for the erection of a 1-story, 50 x 147-foot plant at Cambridge.

BOSTON.—The Chapman Mfg. Co. has been incorporated to manufacture machinery and mechanical devices. The new company is capitalized at $400,000 by Daniel J. Shea, D. L. Wilson, Alton F. Tupper and Charles E. Dolley.

BROCKTON, MASS.—The Brockton Iron & Metal Co. has been incorporated with $2,000 capital by William E. Edelstone, president, Max Smith, treasurer, and S. Nurenberg.

CHELSEA, MASS.—Atwood & McManus have let a contract for the erection of a 3-story, 38 x 50 x 150-foot plant addition.

GREENFIELD, MASS.—The American Tap & Die Co. has awarded a contract for a 50 x 60-foot addition to its plant.

HAVERHILL, MASS.—The Massachusetts Northern Railway Co., Franklin Woodman, 50 Merrimac street, Haverhill, general manager, will build a new boiler house and rebuild its car barn at Merrimac.

NORTH BROOKFIELD, MASS.—Thomas G. Richards has bought the B. & R. Rubber Co. at receiver's sale for $228,000. He is a former president of the company.

SPINGFIELD, MASS. — McClintock & Craig, engineers, 33 Lyman street, will let a contract shortly for the erection of additions to the plant of the Gilbert & Barker Mfg. Co., West Springfield, to cost about $300,000.

HARTFORD, CONN.—The Whitney Mfg. Co. expects shortly to let a contract for the erection of a 4-story, 58 x 112-foot addition.

TORRINGTON, CONN. — The Standard Co., a subsidiary of the Torrington Co., has awarded to Frank W. Fuller a contract for the erection of a 4-story, 54 x 309-foot addition to cost about $60,000.

WATERBURY, CONN.—The Metal Specialty Mfg. Co. has awarded to the Geo. S. Chatfield Co. a general contract for the erection of a 1-story, 100 x 170-foot plant addition and a new boiler house.

From the Alleghenies to the Sea

BROOKLYN, N. Y.—The Pathe Freres Phonograph Co., 29 West Thirty-eighth street, New York, has let a contract for the erection of a 7-story, 85 x 100-foot plant at Brooklyn.

BUFFALO. — The King Sewing Machine Co. has let a contract for the erection of a 1-story, 60 x 80-foot foundry addition.

BUFFALO.—The F. F. Dalley Co., 321 Military road, plans to build a 5-story, 80 x 90 feet, reinforced concrete addition to its factory.

BUFFALO.—The Kittinger Furniture Co., 15 Front avenue, plans to build a 3-story, 80 x 300-feet, reinforced concrete factory at Erie railroad and Elmwood avenue.

ELMIRA, N. Y.—The Morrow Mfg. Co. has let a contract for the erection of factory No. 49, a 1-story, 100 x 370-foot structure to cost about $150,000.

FARMINGDALE, L. I., N. Y.—Deutsch & Pollis, 50 Church street, New York, are taking bids for a 1-story, 100 x 108-foot foundry to be erected at Farmingdale.

LONG ISLAND CITY, N. Y.—The National Refining Co., 129 Front street, New York, has let a contract for an addition to its 9-story plant in Front street, Long Island City.

LONG ISLAND CITY, N. Y.—The Mohe-

Electric Steel

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Electric Steel Ingots

500 TONS Per Month

Electric Steel Castings

300 TONS Per Month

Alloy Steel Castings or Ingots Made to Specifications

THIS is your opportunity to contract for your requirements of Steel Ingots or Castings. The output of our new Electric Steel Plant, which has just been completed and placed in operation, has not yet been contracted for.

The plant is equipped with a Three-Ton Heroult Electric Furnace and is the outgrowth of our crucible steel casting business.

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gan Tube Co. has let a contract to the Wm. Kennedy Construction Co., 215 Montague street, Brooklyn, for the erection of a 1-story, 100 x 250-foot plant.

NEW YORK.—The Manhattan Brass Co., 322 West Fifty-eighth street, has let a contract for the erection of a 1-story, 20 x 100-foot plant addition.

NEW YORK.—The Hooper-Falkenau Engineering Co., 233 Broadway, has let a contract for the erection of a 1-story, 54 x 105-foot factory addition for the Port Morris Industrial Terminal Co., 431 East 105th street.

NIAGARA FALLS.—The Niagara Electro-Chemical Co. has awarded to the Buffalo Structural Steel Co., Dart street, Buffalo, a contract for the steel work for a 4-story and basement, 50 x 170-foot factory at Buffalo avenue and Adams street.

NIAGARA FALLS.—The Aluminum Co. of America has awarded a contract to the Turner Construction Co., 311 Prudential building, Buffalo, for erecting a 6-story, 93 x 67-foot, reinforced concrete addition to its plant at Buffalo avenue and Nineteenth street.

ROCHESTER, N. Y.—The North East Electric Co., 348 Whitney street, will build a 1-story, 44 x 121-foot plant addition.

SCHENECTADY, N. Y.—The American Locomotive Co. has let a contract to John McDermott, 103 Wendell avenue, for the erection of a 1-story foundry addition, 100 x 175, 55 x 200 and 55 x 200 feet.

SYRACUSE, N. Y.—The Crucible Steel Co. of America has let a contract for the erection of a 2-story, 30 x 80-foot, wire mill and a 1-story, 30 x 300-foot shed.

SYRACUSE, N. Y.—The H. H. Franklin Mfg. Co. has started work on the erection of an addition to its plant to consist of a 3-story building, of reinforced concrete construction with a floor space of 143,000 feet.

BOONTON, N. J.—The Cunningham Foundry Corporation has been incorporated with $15,000 to operate an iron and brass foundry. The incorporators are Samuel W. Round, George W. Redfern, Jersey City, and James S. Cunningham, Boonton.

CAMDEN, N. J.—The New York Ship Building Co. has let a contract to the McClintic-Marshall Co. for the erection of a 1-story, 131 x 169-foot addition.

ELIZABETH, N. J.—F. L. Schmidth & Co. will erect a foundry, 49 x 108 feet with a wing, 25 x 49 feet, to cost $16,000.

IRVINGTON, N. J.—The Irvington Smelting & Refining Co., 122 Cottage street, has let a contract for the erection of a 1-story, 50 x 97-foot cupola building to cost about $13,000.

JERSEY CITY, N. J.—The Graphite Lubricating Co. has been incorporated to manufacture bearings. The new company is capitalized at $20,000 by William Smalley, Leigh Bache, Bound Brook, N. J.; and Spencer Weart, Jersey City.

NEWARK, N. J.—The General Leather Co. has taken out permit for a 3-story brick factory, 210 x 576 feet at 422-38 Frelinghuysen avenue to cost $155,260 and a 1-story brick factory, 75 x 295 feet to cost $10,000.

NEWARK, N. J.—The Strobell & Crane have been incorporated with $125,000 capital to manufacture tools and machinery. The incorporators are George H. Etrobell, Charles H. Crane, Elizabeth, N. J., and W. Blue and William M. Belke, Newark.

TRENTON, N. J.—The John A. Roebling's Sons Co. will shortly begin rebuilding the wire rope shop, which was destroyed by fire, causing a loss of $1,500,000. The company has taken out a permit for erection of a boiler house at Elmer and Canal streets, to cost $20,000. Other permits will be taken out later.

ALLENTOWN, PA.—The Bonney Vise & Tool Co. is about to start work on the erection of a 1-story, 64 x 160-foot factory building.

APOLLO, PA.—The Apollo Electric Steel Co. is in the market for a 50 or 60-ton electric crane with a 10 or 15-ton auxiliary hoist and a span of 45 feet, for service in an open-hearth steel plant.

BEAVER FALLS, PA.—The Moltrup Steel Products Co. has let a contract for the erection of a 1-story, 70 x 260-foot factory building to cost about $40,000.

CONNELLSVILLE, PA. — The United States Electrical Steel Co., recently organized, has ordered a 10-ton Gronwall-Dixon electric furnace. Additional equipment for the manufacture of electric steel in plate or billet form will be purchased shortly.

EASTON, PA.—The Northampton county commissioners is receiving bids for a county bridge, No. 183, over Indian creek. P. F. Young is county controller.

ERIE, PA.—The Ball Engine Co. has let a contract for the erection of a 2-story, 65 x 182-foot plant addition.

ERIE, PA.—The Lakeside Forge Co. is erecting a 75 x 80-foot addition to its machine shop at a cost of $10,000. A number of new hammers have been installed with other equipment.

GETTYSBURG, PA.—S. L. Johns has been awarded a contract for the erection of a 3-story, 40 x 100-foot factory building for the Middleburg Shirt Factory at Middleburg, Pa.

GREENVILLE, PA.—The Mercer County Light, Heat & Power Co. has awarded a contract for a power plant to the Hanscom Construction Co., at a cost of about $100,000.

MEADVILLE, PA.—The Bronze Metal Co. has awarded a contract to the Walter G. Harper Co. for an addition to its plant, to cost about $17,000.

OIL CITY, PA.—The Railway Device Co. has been incorporated to manufacture railroad devices. The company is capitalized at $10,000 by Jesse E. Okmes, Arthur C. Webster and W. L. Koch, all of Oil City, Pa.

PHILADELPHIA. — The Westinghouse Electric & Mfg. Co. has purchased a site on the Delaware river near Philadelphia and is rushing plans for a new plant.

SHAMOKIN, PA.—M. J. Flynn, engineer, Mt. Camel, Pa., will prepare plans for a bridge across the Susquehanna river between Watsontown and White Deer. The proposed structure will be either a reinforced concrete or steel bridge. The estimated cost of the bridge is $150,000.

SHARON, PA.—The Driggs-Seabury Ordnance Corporation is buying machine tools for the manufacture of machine guns, trench tools, shells and munitions.

TARENTUM, PA.—The Allegheny Valley Water Co. plans to construct a steel standpipe in the Hill district.

UNIONTOWN, PA.—The board of education will receive bids for erecting a 2-story, 86 x 138-foot school, to cost about $100,000. A. P. Cooper, First National bank building, is preparing the plans.

YORK, PA.—The Standard Chain Co. has awarded a contract to the R. J. Hardy Construction Co. for additions to its plant, to cost about $60,000.

DOVER, DEL.—The Alpha Rubber Mfg. Corporation has been incorporated to manufacture rubber tubes, tires and other rubber goods. The new company is capitalized at $1,000,000 by Joseph A. Berger, J. Edward Dean and John F. Rae, all of Chicago.

DOVER, DEL. — The White Metal Die Stamping Co. has been incorporated to manufacture metallic articles. The new company is capitalized at $100,000 capital by S. B. Howard, S. A. Anderson and L. H. Gunther, all of New York.

DOVER, DEL.—The Iron Products Co. has been incorporated to manufacture products of iron, steel and other metals. The new company is capitalized at $500,000 by Clarence J. Jacobs, M. L. Rogers and Harry W. Davis, Wilmington, Del.

BALTIMORE.—The Air Reduction Co., 50 Broad street, New York, is having plans prepared by Wm. Steele & Son, architects, 1600 Arch street, Philadelphia, for a 1-story, 100 x 200-foot plant to be erected at Baltimore.

COLGATE, MD.—The Universal Tool Co. has been incorporated with $1,000 capital and will erect a plant near Colgate. The incorporators are Harry B. Stengle, T. Bayard Williams and Sayde H. Roseberry.

Activities in the Central States

AKRON, O.—The Goodyear Tire & Rubber Co. has taken out a permit for the erection of a 1-story, 48 x 157-foot, steel, concrete and brick boiler house.

AKRON, O.—The Akron Belt Railroad Co. has been incorporated with $250,000 capital by Glen Brown, Attorney Boyland and others. About 58 miles of the track will be electrified.

AMHERST, O.—The Amherst Millwork Co. has been incorporated with $10,000 capital by J. B. Worcester, R. E. McMasters, E. B. Rogers, W. P. Sippel and F. J. Hubbard.

CANTON, O.—The Currie Construction Co., New York City, has been awarded a contract for the construction of a freight house, storage rooms and office building for the Wheeling & Lake Erie railroad in Canton. The estimated cost of the project is $100,000. W. L. Rohbock, 500 Electric building, Cleveland, is the chief engineer.

CANTON, O.—Plans are being prepared for extensive additions to the plant of the Canton Foundry & Machine Co.

CANTON, O.—The Wheeling & Lake Erie railroad will erect a steel and concrete bridge at East Tuscarawas street. W. L. Rohlook is the chief engineer.

CANTON, O.—The Berger Mfg. Co. has taken out a permit for the erection of three 1-story buildings to be of brick and steel construction and to cost $50,000. The structures will be 77 x 300 feet, 40 x 300 feet and 60 x 300 feet, respectively.

CINCINNATI.—The Barrett Mfg. Co.'s new plant will be 75 x 99 feet, two stories. Some special machinery still remains to be purchased.

CLEVELAND.—The Atlas Car & Mfg. Co., Marquette street, contemplates the addition of 60,000 feet of floor space.

CLEVELAND.—The Boldt Low Construction Co. has been awarded a contract for the erection of a warehouse at 1059 West Eleventh street for the Stone Bros. Plans have been prepared by Christian Schwarzenberg & Goede, 512-1900 Euclid building, and call for a building, 120 x 220 feet, brick and

steel construction with elevators and to cost $160,000.

CLEVELAND.—William J. Carter, architect, 1423 Illuminating building, will let contracts soon for the erection of a $25,000 factory at 4414 Perkins avenue, for the Dangler division of the American Stove Co. The building will be four stories, 43 x 97 feet. Six additions to the present buildings and the erection of a supply plant are contemplated.

COLUMBUS, O.—The Columbus Mill & Mine Supply Co. has purchased a 225 x 245-foot site on Marion road and will erect a new plant 200 feet long. Walter Brown is the general manager.

COSHOCTON, O.—The Ohio Service Co. will install a 5,000-kilowatt turbine in the new $25,000 power house now being built on North Fourth street to replace the present building.

DAYTON, O.—The County Commissioners of Montgomery county will open bids July 20, for the construction of the superstructure for the West Carrollton bridge, Jefferson township. This work will consist of a 200-foot and a 100-foot span, each 18 feet wide.

LIMA, O.—The Hester Tire & Rubber Co., Cleveland, will build a 2-story, brick factory building, 50 x 150 feet, and a power house, 30 x 30 feet in Lima.

NILES, O.—The Mahoning Valley Steel Co. has been incorporated with $600,000 capital by Thomas E. Thomas, Jacob D. Waddell, John T. Harrington and J. W. Blockburn.

SALEM, O.—C. R. Morley, president of the Stark Electric railroad, announces that a new passenger depot will be built in Salem by the company.

SANDUSKY, O.—The Continental Rubber Co. will begin work at once on the erection of a 2-story, 50 x 200-foot factory building on West Monroe street.

Springfield, O.—The Miller Improved Gas Engine Co. has awarded a contract to the Concrete Steel Construction Co. for the erection of a 52 x 120-foot addition to its machine shop.

SWANTON, O.—A small amount of equipment will be purchased by the Swanton Light & Power Co., which has increased its capital stock from $10,000 to $20,000.

TOLEDO, O.—E. H. Depenthal has purchased a site at 3133 Park place upon which he will erect a 9-story, 100 x 134-foot fireproof storage building at a cost of $80,000.

TOLEDO, O.—Joseph M. Grasser of the Grasser Motor Co. has purchased a site at Sixteenth and Madison avenues upon which he will build a 2-story, 100 x 100-foot, reinforced concrete building to cost $100,000.

WARREN, O.—The Ohio Corrugation Co. has plans for the erection of a factory to contain six hot and six cold mills. C. H. Riegel, South Pine street, Warren, is the general manager.

WELLSTON, O. — The Wellston Iron & Furnace Co. has been incorporated with $500,000 capital and will operate the Wellston furnace. The incorporators are M. L. Sternberger Jr., S. E. M. Sternberger and J. G. Harding.

XENIA, O.—The county commissioners are preparing to build a 120-foot steel span, 18 feet wide, over the Little Miami river at a cost of $8,639.

FAIRMONT, W. VA.—The Fairmont Hotel Co. will receive bids for a 5-story and basement, 47 x 150-foot hotel, with a wing, 38 x 87 feet. Milburn, Heister & Co., Washington, D. C., are preparing the plans.

WEIRTON, W. VA.—J. Edward Collins, engineer for the Phillips Sheet & Tin Plate Co., is completing plans for a 1-story addition to the sheet mill plant. E. T. Wolf is the general manager of the company.

WELLSBERG, W. VA.—The LaBelle Iron Works Co. will complete its by-product coke ovens by October and is having a bridge constructed by the Dravo Construction Co. over the Ohio river at a cost of $500,000.

WHEELING, W. VA.—An eastern company has purchased a 59-acre site on the Big Grave creek south of Moundsville upon which it will erect a zinc plant to employ about 500 men. the company is capitalized at $1,500,000.

EVANSVILLE, IND.—The Orr Investment Co., 318 South Second street, will build a 3-story garage, 75 x 145 feet. Plans are being prepared by Gilbert & Co., architects, 305 Furniture Exchange building.

FT. WAYNE, IND.—The Horter Mfg. Co. will build a 2-story addition costing $30,000. H. W. Heyer, Ft. Wayne, is the architect.

HAMMOND, IND.—The Warner Implement Co. has been incorporated to manufacture farm machinery. The new company is capitalized at $35,000 by Frank Hammond, Giles Warner and W. F. Bridge.

INDIANAPOLIS, IND.—E. C. Atkins & Co., manufacturers of saws, will build a 2-story forge shop. W. A. Atkins is the superintendent.

INDIANAPOLIS, IND.—The Indiana Die Casting Co. will build a concrete building, 45 x 85 feet, saw-tooth construction, in which it will install die casting machinery.

LOGANSPORT, IND.—The Rutenber Truck Motor Co. has been incorporated with $450,000 capital and will take over the plant of the Western Motor Co. About $150,000 will be spent on equipment. George W. Bowen is one of the incorporators.

NEW ALBANY, IND.—Stephen Day & Sons, New Albany, have been awarded the contract for construction of the Floyd County poor asylum, at their bid of $28,820. The Neville-Kellner Co., Louisville, has the heating installation contract at $3,450. New bids will be asked for the water supply and plumbing system.

SOUTH BEND, IND.—The Quick Action Ignition Co. has been incorporated to manufacture electrical machinery. The new company is capitalized at $450,000 by Otto R. Beyler and others.

WEST LAFAYETTE, IND.—Purdue University, Dr. W. E. Stone, president, will build a brick and steel armory, two stories, 260 x 360 feet, costing $250,000. R. P. Daggett, 956 Lemcke Annex building, Indianapolis, is the architect.

WESTPORT, IND.—Bids will be received until July 24 for an electric light system on plans by Chas. Brossman, 1616 Merchants' bank building, Indianapolis.

AURORA, ILL. — A reinforced concrete bridge will be built over the Fox river at a cost of $75,000. Address chief engineer, Aurora, Ill.

CHICAGO.—The T. A. Cummings Foundry Co., 1354 Cortland street, will build a 1-story addition. E. M. Newman is the architect.

CHICAGO.—J. T. H. Patterson, 140 South Clark street, will build a 2-story machine shop at 1143 Diversey boulevard, costing $12,000.

CHICAGO.—The Pullman Co. is having plans prepared for a shop building and crane runways. The Arnold Co., 15 South LaSalle street, is the engineer.

CHICAGO.—The Midland Metal Co. has been incorporated with $25,000 capital by Thomas J. Dee, Walter Y. C. Hunt and Harry E. Radix.

CLAREMONT, ILL. — Bonds for $18,000 have been voted to cover the cost of a waterworks system.

DIXON, ILL.—Bids will be received until Aug. 1 by F. D. Whipp, city supervisor, Springfield, Ill., for two pump houses, steel tank and tower and accessories, at the state epileptic colony. M. D. Schwab, Mallers building, Chicago, is the construction engineer.

JOLIET, ILL.—The Joliet Stove Works will build a 1-story addition. Charles W. Webster, 309 Cutting building, is the architect.

ROCKFORD, ILL.—The Comet Automobile Co. is planning to build a factory. Harry R. Sackett is the president of the company.

ROCK ISLAND, ILL.—The Moline Plow Co. is planning to erect considerable additions to its plant.

WAUKEGAN, ILL.—The McClernan Metal Products Co., recently incorporated, will build a factory at Waukegan at a cost of $50,000.

WYANET, ILL.—The city of Wyanet is to spend $8,000 for a waterworks system.

ALBION, MICH.—The Albion Bolt Co., Mark Merriman, president, a newly incorporated company, plans to erect a factory.

BAY CITY, MICH.—The Webber Construction Co. has been awarded a contract for the erection of a packing house for the Young Packing & Cattle Co. The building will be two stories, 60 x 100 feet and of reinforced concrete construction.

BENTON HARBOR, MICH.—The Benton Harbor Malleable Foundry Co. will build an addition to its pattern shop and foundry at a cost of $5,000.

CALUMET, MICH.—J. D. Chubb, architect, 109 North Dearborn street, Chicago, will prepare plans for the new $100,000 high school and manual training institute. The building will be 62 x 168 feet, three stories and basement.

CONSTANTINE, MICH.—The waterworks system is to be improved at a cost of $12,000. A. H. Smith Co., Toledo, O., is the engineer.

DETROIT.—The General Engineering Co. has been incorporated with $2,000,000 capital by Abner Doble and others.

DETROIT.—The Barrett Mfg. Co., 17 Battery place, will build a condenser and distillation plant costing $100,000 at Detroit.

DETROIT.—W. Norton, owner of the Hotel Norton is to build a 14-story hotel, 50 x 100 feet, to cost $250,000. Rogers, Bonnack & Chaffee, Farwell building, are the architects.

DETROIT.—The Michigan Iron & Wire Works has been incorporated with $10,000 capital by C. A. Weigel, L. E. Weigel and J. A. Weigel.

DETROIT.—The Alloy Die Casting Co. has been incorporated to manufacture dies and die castings. The company is capitalized at $25,000 by Henry Hensler, Ralph Johnson and F. P. Minckler.

DETROIT. — The Detroit Seamless Steel Tube Co. has purchased a large tract of land at West Fourth and Boyd streets upon which it will erect a plant to contain 400,000 square feet of floor space. The proposed building will be of reinforced concrete construction and will cost $100,000.

ESSEXVILLE, MICH.—The Alter Motor Car Co., F. M. Woodward, general manager, is considering plans for a factory.

FLINT, MICH.—The Grand Cushion Spring Co. plans to erect a factory at Flint. L. A. Young, Detroit, president of the Detroit Wire Spring Co., is interested.

FLINT, MICH.—The Chevrolet Motor Co. has been granted a permit to erect a railroad and private traffic bridge over the Flint river at a cost of $35,000.

GRAND RAPIDS, MICH.—The Valley City Chair Co. is having plans prepared for a machine shop and power house to cost $100,000. John Thiviates is the president.

JACKSON, MICH.—The Parrott Tractor Co. has been reorganized under the name of the Parrott Motive Power Co. with $500,000 capital stock and is seeking a plant for the manufacture of farm tractors.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Lower price to Jan. 1, 1917; higher to July 1, 1917.)

Bessemer valley	$21.00 to 21.50
Bessemer, Pittsburgh	21.95 to 22.45
Basic, Pittsburgh	18.95 to 19.20
Basic, eastern Pa.	19.00 to 19.50
Basic, Buffalo	19.00 to 19.50
Malleable, Pittsburgh	19.45 to 19.95
Malleable foundry, Chicago	19.50
Malleable foundry, Philadelphia	21.00 to 21.50
Malleable foundry, Buffalo	18.50 to 19.00
No. 1X foundry, Philadelphia	20.25 to 20.75
No. 2 foundry, Pittsburgh	19.45 to 19.70
No. 2 foundry, Cleveland	18.80 to 19.30
No. 2 foundry, Ironton	18.50 to 19.00
No. 2 foundry, Chicago	19.00
No. 2X foundry, Philadelphia	19.75 to 20.25
No. 2X foundry, N. J. tidewater	19.75 to 20.25
No. 2X foundry, Buffalo	18.50 to 19.00
No. 2 plain, Philadelphia	19.25 to 19.75
No. 2 plain, N. J. tidewater	19.25 to 19.75
No. 2 plain, Buffalo	18.25 to 18.75
No. 2 southern, Birmingham	14.00 to 15.00
No. 2 southern, Cincinnati	16.90 to 17.90
No. 2 southern, Chicago	18.00 to 19.00
No. 2 southern, Phila. delivery	19.00 to 19.50
No. 2 southern, Cleveland	18.00 to 19.00
No. 2 southern, New York docks	18.00 to 18.50
No. 2 southern, Boston docks	18.25 to 18.75
No. 2 south. interior, New Eng.	19.00 to 20.00
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X, furnace	18.50 to 19.00
Virginia 2X, Philadelphia	21.25 to 21.75
Virginia, No. 2X, Jersey City	21.00 to 21.50
Virginia 2X, Boston points	21.75 to 22.25
Gray forge, eastern Pa.	19.00 to 19.50
Gray forge, Pittsburgh	18.95
Gray forge, Birmingham	13.00 to 14.00
Silveries, 8 per cent, furnace	24.00 to 27.00
Silveries, 8 per cent, Chicago	31.50
Low phos. Standard, Phila.	32.00 to 34.00
Low phos. Lebanon, Pa. furnace	29.00 to 31.00
Low phos. Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	19.75 to 22.25
Charcoal, Buffalo	21.00 to 22.00
Charcoal, Birmingham	22.50 to 23.00

IRON ORE

Lake Superior Ores.
(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bess., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.
(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit	8.5c to 8.9c
Local N. Y. and N. J. ores, unit	8.5c to 8.75c
Port Henry lump, at mines, ton.	$4.00

Foreign Ores.
(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bess., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$2.65 to 2.75
Connellsville fur., contract	2.40 to 2.50
Connellsville foundry, contract	3.15 to 3.40
Connellsville foundry	3.00 to 3.25
Wise county furnace, contract	2.85 to 3.25
Wise county foundry, contract	3.50 to 3.75
Pocahontas foundry, contract	3.25 to 3.75
Pocahontas furnace, contract	2.85 to 3.25
New River foundry, contract	3.75 to 4.25
New River furnace, contract	3.25 to 3.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, seaboard, prompt	$175 to 200
Ferro manganese, 80 per cent, seaboard, contract	175
Spiegel, 20 per cent, fur. early and last half	50.00 to 55.00
Ferro-silicon, 50 per cent, Phil.	83.00 to 85.00
Ferro-silicon, 50 per cent, Pbgh.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $32.00; 10 to 11 per cent, $33.00; 11 to 12 per cent, $34.00; 12 to 13 per cent, $35.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billet, Phila	$45.00 to 50.00
Forging billets, Phila.	65.00 to 70.00
Forging billets, Pbgh., nominal	65.00 to 70.00
Forging billets, Chicago	65.00
Wire rods, Pittsburgh (nom.)	60.00 to 65.00
Bessemer billets, Youngstown	40.00 to 45.00
Bessemer billets, Pittsburgh	40.00 to 45.00
Open hearth billets, Pittsburgh	40.00 to 45.00
Open hearth billets, Youngstown	40.00 to 45.00
Bess. sheet bars, Youngstown	40.00 to 45.00
Op. h'th sheet bars, Youngstown	40.00 to 45.00
Bess. sheet bars, Pittsburgh	40.00 to 45.00
Open hearth sheet bars, Pbgh.	40.00 to 45.00
Muck bars, Pittsburgh (nominal)	40.00 to 45.00

SKELP

Grooved steel skelp	2.50c
Sheared steel skelp	2.75c

RAILS AND TRACK MATERIAL

(Gross tons.)

Stand. Bess. rails, Pbgh. & Chg. delivery after May 1, 1917	$33.00
Stan. op.-h'th rails, Pbg. & Chg. delivery after May 1, 1917	35.00
Light rails, 8 to 10 lbs., Pbgh.	50.00
Light rails, 8 lb., Chicago	43.00
Light rails, 12 to 14 lbs., Pbgh.	49.00
Light rails, 12 lbs., Chicago	42.00
Light rails, 16 to 20 lbs., Pbgh.	48.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York, (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails, 16 to 20 lbs., Chgo.	$41.00
Light rails, 25 to 45 lbs., Pbgh	47.00
Light rails, 25 to 45 lbs., Chgo.	40.00
Relaying rails, standard, Pbgh. and Chicago	$23.00 to 24.00
Relaying rails, light, Chicago	24.00 to 25.00
Angle bars, st. sect., Pbgh. base	2.00c
Angle bars, st. sections, Chgo.	2.00c to 2.50c
Spikes, railroad, Pittsburgh	2.65c to 2.75c
Spikes, railroad, Chicago	2.75c to 2.90c
Track bolts, Pittsburgh	3.25c to 3.50c
Track bolts, Chicago	3.25c to 3.50c
Tie plates, Chicago	50.00 to 55.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh.	2.50c to 2.75c
Structural shops, Philadelphia	2.659c to 2.909c
Structural shapes, Chgo.	2.69c to 3.29c
Structural shapes, New York	2.669c to 2.919c
Tank plates, Chgo.	3.09c to 3.49c
Tank plates, Pittsburgh (con.)	2.90c to 3.00c
Tank plates, Pittsburgh	3.00c to 4.00c
Tank plates, Philadelphia	3.059c to 4.159c
Tank plates, New York	3.069c to 4.169c
Bars, soft steel, Chicago	2.69c to 3.29c
Bars, soft steel, Pbgh.	2.50c to 2.75c
Bars, soft steel, New York	2.669c to 2.916c
Bars, soft steel, Philadelphia	2.659c to 2.905c
Hoops, carloads, Pittsburgh	2.75c to 3.00c
Bands, Pittsburgh	2.50c to 2.75c
Shafting, Pbgh., contr. carloads	10 to 20 off
Bar iron, Chgo.	2.35c to 2.50c
Bar iron, Philadelphia	2.559c
Bar iron, Cleveland	2.40c
Bar iron, New York	2.569c
Bar iron, Pittsburgh	2.65c to 2.75c
Hard steel bars, Chgo.	2.50c to 2.75c

SHEETS AND TIN PLATE

Bessemer.

BLUE ANNEALED SHEETS PITTSBURGH

	Per lb.
Nos. 3 to 8	2.95c to 3.20c
Nos. 9 to 10	3.10c to 3.35c
Nos. 11 and 12	3.15c to 3.40c
Nos. 13 and 14	3.20c to 3.45c
Nos. 15 and 16	3.30c to 3.55c

Bessemer.

BOX ANNEALED SHEETS, COLD ROLLED PITTSBURGH

Nos. 17 to 21	2.70c to 2.85c
Nos. 22 and 24	2.75c to 2.90c
Nos. 25 and 26	2.80c to 2.95c
No. 27	2.85c to 3.00c
No. 28	2.90c to 3.05c
No. 29	2.95c to 3.10c
No. 30	3.05c to 3.30c

Bessemer.

GALVANIZED SHEETS OF BLACK SHEET GAGE, PITTSBURGH

Nos. 10 and 11	3.50c to 3.65c
No. 12	3.60c to 3.75c
Nos. 13 and 14	3.60c to 3.75c
Nos. 15 and 16	3.70c to 3.85c
Nos. 17 to 21	3.85c to 4.00c
Nos. 22 and 24	4.05c to 4.20c
Nos. 25 and 26	4.20c to 4.35c
No. 27	4.35c to 4.50c
No. 28	4.50c to 4.65c
No. 29	4.65c to 4.80c

No. 28, black, Chicago	3.09c to 3.19c
No. 28, galvanized, Chicago	5.19c
No. 10, blue annealed, Phila.	3.409c to 3.909c
No. 10, blue annealed, Chgo.	3.19c to 3.29c
Tin plate, 100 lb., coke base	$5.75 to 6.00

IRON AND STEEL PIPE

(Prices Adopted April 21, 1916.)

Steel.

Butt weld:—	Black.	Galv.
⅛, ¼ and ⅜ in.	63	30
½ in.	67	40
¾ to 3 in.	70	50
Lap weld:—		
2 in.	65	40
2½ to 6 in.	68	48
7 to 12 in.	65	44½
13 and 14 in.	53½	..
15 in.	51	..

Iron.

Butt weld:—	Black.	Galv.
⅛ and ¼ in.	52	19
⅜ in.	53	20
½ in.	57	33
¾ to 1½ in.	60	38
Lap weld:—		
1¼ in.	48	26
1½ in.	54	33
2 in.	55	34
2½ to 4 in.	57	37
4½ to 6 in.	57	37
7 to 12 in.	56	36

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	50 to 52
Iron, 3½ to 4½ inches, l. c. l.	40 to 42

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.50 to 2.70
Plain wire, jobbers', Pittsburgh	2.45 to 2.65
Galvanized wire, jobbers', Pbgh.	3.15 to 3.35
Polished staples, Pbgh.	2.65 to 2.85
Galvanized staples, Pbgh.	3.35 to 3.55
Barb wire, painted, jobbers' Pbgh.	2.65 to 2.85
Barb wire, galv., jobbers', Pbgh.	3.35 to 3.55

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 50 and 10, cut threads, 50, larger or longer, 40.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or short, rolled 50, 10 and 5; cut, 50 and 5; larger or longer, 40 and 10.

Cold pressed, semi-finished hexagon nuts, 60 and 10.

Gimlet and cone point lag bolts, 50 and 10. Hot pressed square, blank or tapped nuts, $2.90 off list; hot pressed hexagon blank or tapped, $2.90.

Cold pressed square, blank or tapped, $2.60 off; hexagon, blank or tapped, all sizes, $3.00.

RIVETS

Structural rivets, Pbgh	4.00c to 4.25c
Structural rivets, Chgo. delivery	3.50c
Boiler rivets, Pbgh	4.10c to 4.35c
Boiler rivets, Chgo. delivery	3.60c

STEEL SHEET PILING

(Pittsburgh)

Base sizes	2.50c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	5.00c to 5.50c

COLD ROLLED STRIP STEEL

Base price 6.00c to 6.50c per 100 pounds, hard, coils 1½ inches and wider and by .100 inches and heavier.

Extra for Thickness.

0.100-inch and thicker	Base
0.050 to 0.099	$0.05
0.036 to 0.049	0.20
0.035	0.20
0.031 to 0.034	0.35
0.026 to 0.030	0.45
0.020 to 0.024	0.55
0.025	0.45
0.017 to 0.019	1.35
0.015 to 0.016	1.75
0.013 to 0.014	2.45
0.012	2.80
0.011	3.15
0.010	3.50

Other extras as per card of March 15, 1916.

CAST IRON WATER PIPE

Four-inch, Chicago	$33.50 to 34.00
Six-inch and larger, Chicago	30.50 to 31.00
Six-inch Class B, New York	30.50
Four-inch Class B New York	33.50
Four to six-inch Birmingham	28.00
Six-inch and larger Birmingham	25.00

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.10c
Steel squares, 2-in. & ov., Cleve.	3.75c
Steel rounds, 2-in. & ov., Cleve.	3.75c
Steel bars, under 2 in., Cleveland	3.25c
Steel bars, Detroit	3.25c
Steel bars, Philadelphia	3.25c to 4.10c
Steel bars, New York	3.00c to 3.25c
Steel bars, St. Louis	3.15c
Steel bars, Cincinnati	3.20c to 3.75c
Steel bars, St. Paul	3.20c
Steel bars, over 2-in., Buffalo	4.20c
Steel bars, Buffalo	3.35c
Iron bars, Chicago	3.10c
Iron bars, Cleveland	3.20c
Iron bars, Detroit	3.25c
Iron bars, St. Louis	3.10c
Iron bars, Cincinnati	3.20c to 3.75c
Iron bars, Philadelphia	3.00c to 3.25c
Iron bars, New York	3.25c
Shapes, Chgo.	3.10c
Shapes, Detroit	3.25c
Shapes, St. Louis	3.15c
Shapes, St. Paul	3.20c
Shapes, New York	3.00c to 3.25c
Shapes, Cleveland	3.25c
Shapes, Philadelphia	3.00c to 3.25c
Shapes, Buffalo	3.35c
Shapes and plates, Cincinnati	3.20c to 3.50c
Plates, Chgo.	3.50c
Plates, Detroit	3.60c to 4.00c
Plates, St. Louis	3.55c
Plates, St. Paul	3.60c
Plates, New York	4.25c to 4.50c
Plates, Cleveland	3.65c
Plates, Philadelphia	4.00c to 4.25c
No. 10 blue anl. sheets, Chgo.	3.40c
No. 10 blue anl. sheets, Cleve.	3.50c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sheets, St. L.	3.45c
No. 10 blue anl. sheets, Cinci.	3.40c to 3.50c
No. 10 blue anl. sheets, St. Paul	3.50c
No. 10 blue anl. sheets, Detroit	3.55c
No. 28 black sheets, Chgo.	3.20c
No. 28 black sheets, Cleveland	3.20c to 3.25c
No. 28 black sheets, Cinci.	3.25c to 3.40c
No. 28 black sheets, Detroit	3.50c
No. 28 black sheets, St. Louis	3.30c
No. 28 black sheets, St. Paul	3.35c
No. 28 galv. sheets, Chgo.	5.25c to 5.50c
No. 28 galv. sheets, Cleveland	5.25c
No. 28 galv. sheets, Cincinnati	5.25c
No. 28 galv. sheets, Detroit	5.25c
No. 28 galv. sheets, St. Louis	5.30c to 5.50c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Angle bars, iron, Chicago	$18.00 to 18.50
Angle bars, steel, St. Louis	12.50 to 13.00
Arch bars and transoms, Chgo.	19.50 to 20.00
Arch bars and transoms, St. L.	19.00 to 20.00
Boiler plate, cut, No. 1, Chgo.	10.50 to 11.00
Boiler plate, cut, No. 1, St. L.	8.50 to 9.00
Boiler punchings, Chicago	13.50 to 14.00
Bundled sheet, Cincinnati	8.25 to 8.75
Busheling, No. 1, Chicago	12.00 to 12.50
Busheling, No. 1, Cincinnati	10.00 to 10.50
Busheling, No. 1, Cleveland	11.75 to 12.00
Busheling, No. 1, St. Louis	10.00 to 10.50
Busheling, No. 2, Chicago	9.00 to 9.50
Cast borings, Chicago	6.00 to 6.50
Cast borings, Cincinnati	5.50 to 6.00
Cast borings, Cleveland	5.75 to 6.00
Cast borings, St. Louis	5.25 to 5.75
Cast, No. 1, Chicago	12.00 to 12.50
Cast, No. 1, Cincinnati	10.50 to 11.00
Cast, No. 1, Cleveland	13.00 to 13.50
Cast, No. 1, St. Louis	9.75 to 10.25

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Cut forge, Chicago	13.75 to 14.25
Iron axles, St. Louis	21.50 to 22.00
Iron axles, Cleve.	23.00 to 24.00
Knuckles, coup., Chicago	15.50 to 16.00
Knuckles, coup., St. Louis	12.75 to 13.25
Locomtive tires, Chicago	20.00 to 20.50
Locomotive tires, St. Louis	19.50 to 20.00
Machine shop turnings, Chgo.	5.50 to 6.00
Machine shop turnings, Cleve.	6.00 to 6.25
Machine shop turnings, Cinci.	5.50 to 6.00
Machine shop turnings, St. L.	5.25 to 5.75
Malleable agricultural, Chgo.	11.00 to 11.50
Malleable agricultural, St. Louis	10.00 to 10.50
Malleable, Cincinnati	8.25 to 8.75
Malleable railroad, Chicago	11.75 to 12.25
Malleable railroad, St. Louis	11.00 to 11.50
Pipes and flues, Cleveland	11.25 to 11.50
Pipes and flues, Chgo.	10.75 to 11.25
Pipes and flues, St. Louis	9.00 to 9.50
Railroad wrought, No. 1, Chgo.	15.25 to 15.75
Railroad wrought, No. 1, Cleve.	15.00
Railroad wrought, No. 1, St. L.	14.50 to 15.00
Railroad wrought, No. 1, Cinci.	13.00 to 13.50
Railroad wrought, No. 2, Chgo.	14.00 to 14.50
Railroad wrought, No. 2, St. L.	13.50 to 14.00
Shafting, St. Louis	$16.75 to 17.25
Springs, St. Louis	12.75 to 13.25
Springs, Chicago	16.00 to 16.50
Steel car axles, St. Louis	23.00 to 23.50
Steel car axles, Chicago	26.00 to 26.50
Stove plate, Chicago	11.25 to 11.75
Stove plate, Cleveland	10.00
Stove plate, Buffalo	11.00 to 11.50
Stove plate, Cincinnati	8.00 to 8.50
Stove plate, St. Louis	7.00 to 7.50

(Gross tons.)

Axle turnings, Cleveland	$11.50 to 12.00
Busheling, No. 1, Buffalo	13.00 to 13.50
Busheling, No. 1, Pittsburgh	13.00 to 13.50
Busheling, No. 2, Buffalo	11.00 to 11.50
Bundled sheets, Pittsburgh	13.50 to 13.75
Bundled sheets, Cleveland	13.00 to 13.25
Bundled sheets, Buffalo	11.50 to 12.00
Car wheels (iron), Pittsburgh	14.00 to 14.50
Car wheels (steel), Pittsburgh	17.50 to 18.00
Car wheels, Chicago	12.50 to 13.00
Car wheels, eastern Pa.	16.00 to 16.50
Car wheels, Buffalo	13.00 to 13.50
Car wheels, N. Y.	13.75 to 14.00
Car wheels, St. Louis	11.50 to 12.00
Car wheels, Birmingham	10.50 to 11.00
Tram car wheels, B'ham.	9.50 to 10.00
Cast borings, New York	7.50 to 8.00
Cast borings, eastern Pa.	10.00 to 10.50
Cast borings, Buffalo	8.00 to 8.25
Cast borings, Pittsburgh	9.00
Cast, No. 1, eastern Pa.	16.00 to 16.50
Cast, No. 1, Pittsburgh	14.75 to 15.00
Cast, No. 1, Birmingham	11.00 to 11.50
Cast, heavy No. 1, N. J. points	16.50 to 17.00
Forge, No. 1, eastern Pa.	13.00 to 13.50
Frogs, switches, guards, St. L.	14.00 to 14.25
Grate bars, Buffalo	11.50 to 12.00
Grate bars, N. J. points	12.50 to 13.00
Heavy axle turnings, Buffalo	12.00
Heavy melting steel, Pbgh.	16.50 to 17.25
Heavy melting steel, Buffalo	15.50 to 16.00
Heavy melting steel, Chgo.	14.00 to 14.50
Heavy melting steel, Cleveland	14.50 to 15.00
Heavy melting steel, Cincinnati	13.50 to 14.00
Heavy melting steel, eastern Pa.	15.25 to 15.75
Heavy melting steel, New York	14.00 to 14.25
Heavy melting steel, St. L.	14.25 to 14.75
Heavy melting steel, B'ham.	10.00 to 10.50
Iron rails, Chgo.	18.50 to 19.00
Iron rails, Buffalo	18.00 to 18.50
Iron rails, Cincinnati	13.50 to 14.00
Iron rails, St. Louis	16.00 to 16.50
Iron rails, Cleveland	18.00
Iron axles, Pittsburgh	25.50 to 26.00
Iron axles, Cincinnati	20.00 to 20.50
Iron axles, eastern Pa.	27.00 to 28.00
Iron axles, Chicago	26.50 to 27.00
Iron axles, Buffalo	24.00 to 24.50
Low phos. steel, Buffalo	20.00 to 20.50
Low phos. steel, Pbgh.	19.50 to 20.50
Low phos. steel, eastern Pa.	20.00 to 21.00
Machine shop turnings, Buffalo	7.00 to 7.50
Mch. shop turnings, New York	7.00 to 7.50
Mch. shop turnings, Pbgh.	9.00
Mch. shop turnings, eastern Pa.	8.50 to 9.00
Malleable railroad, Cleveland	14.25 to 14.75
Malleable railroad, Buffalo	15.00 to 16.00
Malleable railroad, Pittsburgh	14.00
Malleable railroad, eastern Pa.	13.00 to 13.50
R. R. and mch. cast, No. 1 Bfl.	15.50 to 16.00
R. R. wrought, No. 1, Buffalo	17.25 to 17.75
R. R. wrgt., No. 1, eastern Pa.	19.50 to 20.00
R. R. wrgt., No. 1, New York	18.00 to 18.50
R. R. wrought, No. 1, Pbgh.	18.25 to 18.75
R. R. wrought, No. 1, B'ham.	13.00 to 13.50
Reroll. rails, 5 ft. & ov., Pbgh.	16.75 to 17.25
Reroll. rails, 5 ft. & ov., Chgo.	16.00 to 16.50
Reroll. rails, 5 ft. & ov., Cleve.	15.00
Reroll. rails, 5 ft. & ov., E. P.	17.00 to 18.00
Reroll. rails, 5 ft. & ov., St. L.	15.25 to 15.75
Shafting, New York	20.00 to 20.50
Shafting, eastern Pa.	20.00 to 21.00
Shoveling steel, Chicago	13.50 to 14.00
Shoveling steel, St. Louis	11.50 to 12.00
Steel rails, short, Chicago	15.50 to 16.00
Steel rails, short, Cleveland	18.00
Steel rails, old, B'ham.	11.00 to 11.25
Steel rails, short, St. Louis	14.00 to 14.50
Steel car axles, Birmingham	21.00 to 22.00
Steel car axles, New York	25.00 to 25.50
Steel car axles, Buffalo	24.00 to 24.50
Steel car axles, Cleveland	28.00
Steel car axles, Pittsburgh	26.50 to 27.00
Steel car axles, eastern Pa.	25.00 to 26.00
Stove plate, N. J. points	12.25 to 12.50
Stove plate, Birmingham	9.50 to 10.00
Stove plate, Pittsburgh	11.00 to 11.25
Stove plate, eastern Pa.	12.00 to 12.50
Wrought pipe, New York	10.25 to 10.75
Wrought pipe, eastern Pa.	12.50 to 13.00
Wrought pipe, Buffalo	12.00 to 12.50

"Where-To-Buy"

A classified-by-products list of advertisers for the convenience of readers. If you don't find what you want, write us and we will tell you where to get it. ¶ Index to advertisements will give you page number of any advertiser and by referring to advertisement you can get full particulars about products.

ACETYLENE IN CYLINDERS.
Linde Air Products Co., New York City.
Prest-O-Lite Co., The, Indianapolis, Ind.

ACCUMULATORS.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa
Chambersburg Engrg. Co., Chambersburg, Pa.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Tod, Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Watson-Stillman Co., New York City.
Wood, R. D., & Co., Philadelphia, Pa.

ACCUMULATORS.
(Hydraulic.)
Southwark Fdy & Mch. Co., Philadelphia, Pa.

AEROPLANE WIRE, STRAND AND CORD.
Roebling's, John A., Sons Co., Trenton, N. J.

ALLOYS.
American Vanadium Co., Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng
Bourne-Fuller Co., The, Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
United Steel Co., Canton, O.

ALUMINUM ALLOYS.
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM.
(Granulated.)
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM.
(Solder.)
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.

ALUMINUM INGOTS.
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM RODS.
(Sheet.)
United Smelt'g & Alum. Co., New Haven, Ct.

ANGLES, TEES, CHANNELS.
(See Steel, Structural.)

ANNEALING BOXES AND POTS.
Mesta Machine Co., Pittsburgh, Pa.
Pittsburgh Annealing Box Co., Pittsburgh, Pa.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Pittsburgh Valve Foundry & Const. Co., Pittsburgh, Pa.
Swedish Crucible Steel Co., Detroit, Mich.
United Engrg. & Foundry Co., Pittsburgh, Pa.
Zanesville Malleable Iron Co., Zanesville, O.

ARMATURES.
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

ASH BUCKETS.
Lakewood Engrg. Co., Cleveland, O.

AXLES.
American Bridge Co., New York City.
Bethlehem Steel Co., So. Bethlehem, Pa.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.

BABBITT METAL.
Lubricating Metal Co., The, New York City.

BAKERS, WIRE COATING.
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BALLS.
(Steel.)
Bethlehem Steel Co., The, So. Bethlehem, Pa.
New Departure Mfg. Co., Bristol, Conn.

BANDS.
(Steel.)
Carnegie Steel Co., Pittsburgh, Pa.

BARGES.
(Steel.)
American Bridge Co., New York City.

BARRELS, TUMBLING.
(Wire Nails.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BARS—ALLOY.
Central Steel Co., The, Massillon, O.

BARS.
(Concrete Reinforcing.)
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Ryerson, Jos. T., & Son, Chicago, Ill.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.

BARS.
(Iron and Steel.)
American Bridge Co., New York, N. Y.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Trussed Concrete Steel Co., Detroit, Mich.
United Steel Co., Canton, O.
Upson Nut Co., Cleveland, O.

BEAMS, CHANNELS AND ANGLES.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

BEARINGS.
(Ball.)
New Departure Mfg. Co., Bristol, Conn.

BEARINGS.
(Vanadium Steel.)
American Vanadium Co., The, Pittsburgh, Pa.

BELLS.
(Marine and Locomotive.)
Vanduzen, E. W., Co., The, Cincinnati, O.

BELT CEMENT AND DRESSING.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.
Williams, I. B., & Sons, Dover, N. H.

BELT LACING.
(Leather.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BELTING.
(Chain.)
Link-Belt Co., Chicago, Ill.

BELTING—LEATHER.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BENCHES.
(Steel.)
New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES.
(Drawing.)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.
Abramsen Engrg. Co., Pittsburgh, Pa.
Bertsch & Co., Cambridge City, Ind.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Covington Machine Co., Covington, Va.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Watson-Stillman Co., New York, N. Y.

BENZOL RECOVERY PLANTS.
Koppers, H., Co., Pittsburgh, Pa.

BILLETS.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Whitaker-Glessner Co., Portsmouth Works, Portsmouth, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown.

BLAST FURNACE SKIP CARS.
Lakewood Engrg. Co., Cleveland, O.

BLAST FURNACE VOLUME METERS.
Clark, Chas. J., Chicago, Ill.

BLOCKS.
Bethlehem Steel Co., The, So. Bethlehem, Pa.

BLOOMS.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Hillman, J. H., & Sons, Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above